## STRIES

In This Issue . . . Automotive Methods Speed Cannon Components

JULY 15, 1952

· · · Latest Proteus Aircraft Gas Turbine · · ·

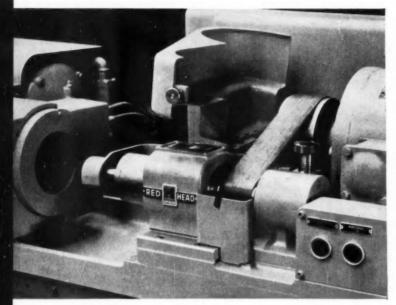
Complete Table of Contents, Page 3

Vacuum Testing Automatic Transmission Cases · · ·

Ceramics Ease Shortages · · · The Business Pulse

### Mere's Now Meald helps you keep a cool head when the heat's on for more production







QUILL STYLE HEADS are used primarily where there is a variety of work. Quills are seated by a taper and may be readily interchanged.



NAKED STYLE HEADS are generally applied to high production work on identical parts. The spindle nose extends beyond the front bearing.

## Heald wheelheads are lubricated for life—run 50% cooler—maintain highest accuracy and precision

With the new Heald Red Head wheelheads, accuracy-destroying heat has been left out in the cold. Improved design, with the lubricant permanently sealed in, gives you a head that runs 50% cooler—never needs oiling—helps you maintain highest production speeds with maximum accuracy and precision.

Heald's complete line of permanently-lubricated Red Head wheelheads — in three different styles and a wide range of speeds and sizes — makes it possible to match the wheelhead to the work on any internal grinding job. Of course, Heald permanently lubricated precision Boringheads used with Heald Bore-Matics are

designed, assembled and tested with equally careful workmanship and experience. Remember — when it comes to precision finishing, it pays to come to Heald.



SLEEVE STYLE HEADS are of extra sturdy construction for grinding large bores. The front bearing is close to the wheel, providing maximum rigidity.

This 12-page booklet lists wheel dimensions and maximum speeds for the complete line of standard Heald wheelheads — with helpful suggestions for proper selection. If you don't have a copy, we'll be glad to send you one.



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Hardened renewable cylinder sleeves test 350-400 Brinell.

Rifle-drilled rods. Oil jets abol pistons.

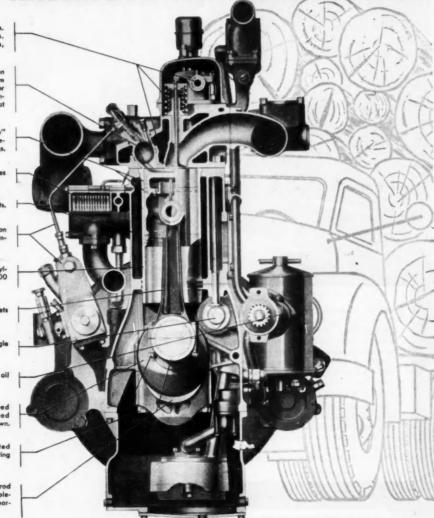
Hardened camshaft, single forging.

High-capacity outside oil pump.

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Alloy-steel heat-treated rod and main bearing bolts.

Hardened main and rod journals. Steel-back, tripleelement precision bearings, pressure ailed.



Waukesha High Duty Diesel, Model 148-DK—six cylinders, 5%-in. bore x 6-in. stroke, 779 cu. in. displacement, peak hp 200. For full details, send for Bulletin 1532.

182

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS. . NEW YORK . TULSA . LOS ANGELES



● This Mattison Vertical Spindle Surface Grinder is being used by Vascoloy-Ramet Corporation, for finishing cutting tool bits made of Tantung, a hard, tough alloy composed principally of cobalt, tungsten, chromium and tantalum-columbium carbide. Because of the rugged construction, ample power and capability for fast stock removal, this Mattison Grinder enables Vascoloy-Ramet to economically grind their tool bits on a real production basis.

The Mattison Vertical Spindle Surface Grinder is built in several sizes for varying requirements. Mattison also manufactures all types of Surface, Face and Disc Grinders. For information covering the Vertical Spindle Grinder shown above as well as our complete line, write for a free copy of our general catalog No. 1901RM.

MATTISON

MACHINE WORKS

CROCKFORD . ILLINOIS

#### AUTOMOTIVE INDUSTRIES

July 15, 1952

Vol. 107, No. 2

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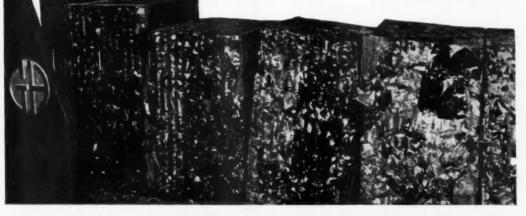
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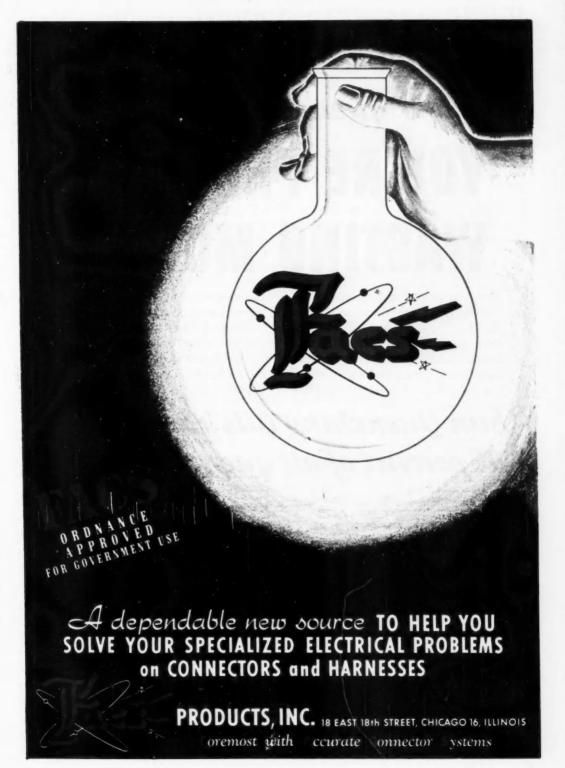
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Whether it's the heavy-duty AD-40 or a small portable power unit, United has an air cleaner - or can build one - to fill the bill. We invite your inquiry.



United Air Cleaner Division — Chicago 28 Mitchell Division - Philadelphia 36 Birmingham 11, Alabama

AIR CLEANERS \* METAL STAMPINGS \* ROLLED SHAPES IGNITION AND TURN SIGNAL SWITCHES \* DOVETAILS

This new Allis-Chalmers AD-40 has 104 brake hp. , weighs 23,000 lb. . . . can handle a 22-inch high windrow. It is equipped with the United Oil Both Air Cleaner illustrated.

#### One Dozen Holes in Perfect Alignment



This "Hy-Power" machine punches 12 precision holes at once. Like this. The wheel and spider are placed in position and raised. Twelve "Hy-Power" Cylinders, operating in multiple, punch the holes. The assemblies then pass along a short conveyor where the rivets are "stuck," and a similar "Hy-Power" unit squeezes the 12 rivets . . . again in a single operation.

This is just another example of how tool engineers are using Hannifin "Hy-Power" Hydraulics in machines they design. The "Hy-Power" Hydraulic Generator, a compact unit including motor, pump, oil reservoir, control valves and high pressure intensifier... supplies the power. Then 12 "Hy-Power" Cylinders exert the force.

#### What does this suggest to you?

Whether you need a one-of-a-kind special or machines to be built in quantity for resale, it will pay you to explore the possibilities of Hannifin "Hy-Power" Hydraulics. For here is equipment that permits you to apply forces up to 100 tons...in any direction.

tion . . . simultaneously. A Hannifin Field Engineer will explain how you can utilize this modern equipment for punching, riveting, staking, bending or crimping operations. Hannifin Corporation, 1143 S. Kilbourn Ave., Chicago 24, III. In addition to speeding output, these
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Write for Bulletin 150

cable.

HOW KELSEY-HAYES IMPROVED QUALITY AND PRODUCTION.

MINIMIZED RUNOUT OF WHEELS

FOR AUTOMOBILES

On Kelsey-Hayes production lines, there

are numerous units like the one shown. Each consists of a "Hy-Power" Hydraulic Generator and twelve 12½-ton "Hy-Power" Cylinders carried in

spring-mounted yokes. Limit switches

control the circuit, preventing operation

until work is in position. High pressure hose lines are sheathed with armored

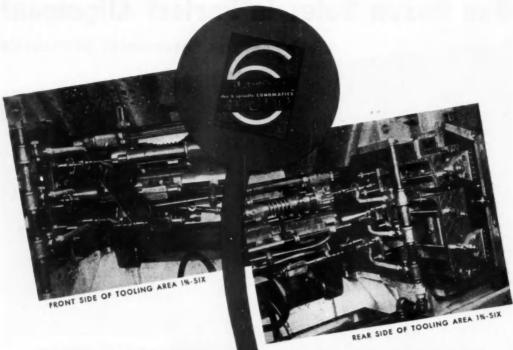
The complete story of Hannifin "Hy-Power" Hydraulics. Your copy sent on request



do ALL you can do . . . with

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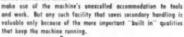
Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves



#### THE IMPORTAN REQUIREMENT

All brands of multiple spindle bar automatics offer value or they would not be on the market. If it were possible to engineer and incorporate the superior qualities of all into one machine, certain features would still be considered more important than others in accordance with the individual buyer's requirements.

Cross drilling without costly spindle stopping is one of many CONO-MATIC innovations which



But there is one essential quality required of all brands - regardless of the job. It is dependable, low cost performance! CONOMATIC users know well its benefits. But you don't have to be a user to know about this feature, or any other feature, of the CONOMATIC. Just write, wire, or phone for the information. There is no obligation.



A Comparison of ALL Automatics is in favor of Cone



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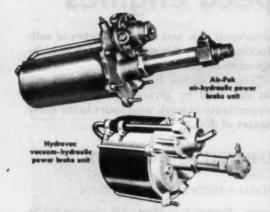
Air-Pak, similar in design and principle to the Hydrovac, has by its outstanding performance established itself as the industry's foremost air-hydraulic power brake unit.

Products of twenty-five years of practical braking experience, these outstanding power braking systems offer faster, more positive and better controlled braking. And in both the vacuum and air actuated units, brakes can be applied instantly by foot power alone—a constant safety factor of importance.

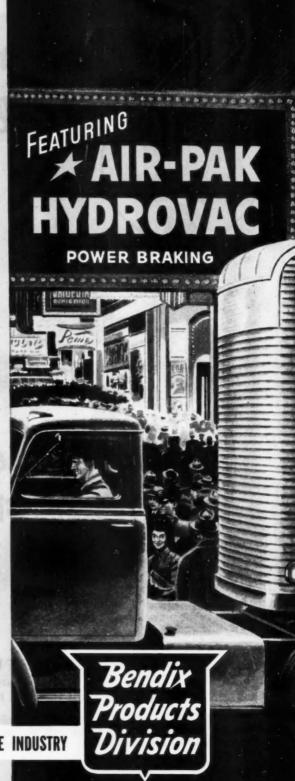
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#### **High Spots of This Issue**

#### Using Automotive Methods to Produce Cannon Components

Oldsmobile Div. of General Motors Corp., faced again with the unique problems of defense work, has supplemented its World War II lessons with new machines and automotivetype, mass-machining techniques for cannon output. Page 32.

#### Latest British Proteus Propeller Turbine Engine

The powerful Bristol Proteus III (700 series) turboprop engine has undergone a number of alterations that have greatly improved its physical structure, efficiency, and performance. An analysis of new features is given. Page 38.

#### Ceramics Ease Metal Shortage

As a practical step toward combating current shortages of strategic metals, especially those needed for aircraft engine production, Solar Aircraft Co. has developed a new series of ceramic coatings for high-temperature alloy steels. See Page 40.

#### High Speed Helicopter

Developed by Jacobs Aircraft Engine Co., this speedy antitorque rotor helicopter of the gyrodyne type has an estimated top speed of between 185 and 190 mph. Production plans for the commercial craft have been completed. Page 42.

#### Specialized Machine Tools for Lincoln Engine Production

There is much detail involved in turning out a Lincoln engine, but Ford Motor Co. has simplified the operation through Automation and specialized machines. Those used for cylinder blocks, heads and crankshafts are described here. Page 44.

#### 20 New Product Items And Other High Spots, Such As:

Electroformed nickel finding new uses; vacuum testing automatic transmission cases; testing fuels and lubricants in modern dynamometer laboratory; ASTM holds golden anniversary meeting; flywheel housings finished in only two machine setups; chemical treatment produces metals from ore concentrates; lightweight exhaust systems for tanks and personnel carriers; and Alfa-Romeo all-purpose car features four-wheel drive.

Automotive and Aviation News, Page 17 Complete Table of Contents, Page 3

AUTOMOTIVE INDUSTRIES COVERS

PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES

• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY •
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

### A Quick Picture Of Steel Stocks

#### What about current Ryerson stocks?

When the steel strike was called early in June our over-all stocks, though still out of balance from a size standpoint, were better than they had been for some months. Naturally we have been losing inventory since then. But here is the picture as these lines are written-6/25/52.

Our stocks of both carbon and allow steel bars are quite spotty with larger diameter bars in short supply, the smaller sizes somewhat better. In carbon steel, cold finished bar stocks are better than hot rolled stocks. In alloys, carburizing types are the most plentiful.

Our stocks of plates and shapes are low, as these products are among the most widely used for defense applications, but we can meet most any requirement for welded tubing and for straight chrome stainless. And sheets are in fair supply, especially cold rolled, heavier than 19 gauge. Other products in good supply at Ryerson: drill rod, tool steel, hydraulic tubing, structural tubing, Inland 4-Way Safety Plate.

#### How about Ryerson service?

Our staff of experienced steel specialists is always at your service to give counsel on any steel problem. You may be surprised at what can be accomplished with their help. For example, we can often suggest practical alternates for steel that's not on hand. And if you always tell us what length or width you are actually using, we may sometimes be able to fill your order from smaller pieces when we could not handle it otherwise. Then too, we are continually adding to our service facilities; so you can depend on quick delivery of available steel.

#### What about the future?

With reasonable restraint on the part of steel users and conformance to government regulations during the strike, we should be able to take care of most essential requirements for some time. Upon resumption of steel production, we will replenish our stocks as rapidly as possible. Meanwhile, you may be sure we'll do our best to help whenever you call.

#### PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot SHEETS—Hot and cold ralled, STAINLESS—Allegheny bars, rolled and cold finished. STAINLESS—Allegheny bars, plates, sheets, tubes, etc.

STRUCTURALS -- Channels, an-

TUBING—Seamless and welded, mechanical and boiler tubes.

PLATES—Many types including ALLOYS—Hot rolled, cold finish-inland 4-Way Safety Plate.

AlloyS—Hot rolled, cold finish-

**BABBITT**—Five types, also Ryertex plastic bearings.

MACHINERY & TOOLS - For metal fabrication.

#### RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK . BOSTON . PHILADELPHIA . CINCINNATI . CLEVELAND . DETROIT PITTSBURGH . BUFFALO . CHICAGO . MILWAUKEE . ST. LOUIS . LOS ANGELES . SAN FRANCISCO . SPOKANE . SEATTLE

## The AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 107, No. 2

July 15, 1952

#### Budd Tank Parts Plant is Dedicated in Phila.

Budd Co. recently played host to 150 guests at a luncheon and exhibit marking the dedication of its new military tank parts plant on Fox St.. near Hunting Park Ave., Philadelphia, Pa.

The \$6 million facility will be known at Unit 6 of the company's Hunting Park Plant. Here, hulls and turrets for a new, medium-weight tank, a development of Army Ordnance, will be machined and welded under subcontract from Chrysler Coro.

Guests inspected the facilities which will turn out the tank hulls and saw an exhibit of products manufactured by Budd at its five plants in Philadelphia, Pa.; Detroit, Mich., and Gary, Ind. Automobile and truck body components and wheels, artillery shells, plows, and other items manufactured by the company were displayed.

Machinery and welded tank hu'ls and turrets are expected to begin emerging from the lines within the next 60 days. When full production is reached, approximately 1000 persons will be employed in the new 270,000 sq ft plant.

#### Allison to Build New, Larger Transmission

Allison Div. of General Motors Corp. is negotiating a \$20 million contract with the Ordnance Corps for production of a new, larger tank transmission. The units are scheduled to be used on a new military vehicle, the identity of which still is restricted.

The new transmission, in addition to being larger, will be of the cross-drive type and similar to two types now being manufactured by Allison. However, the new transmision will reportedly have about 35 per cent fewer parts than the drives now being produced. Buick Motor Div. also is expected to build some of the new type transmissions.



#### **NEW MACK TRACTOR**

One of three new tractors recently introduced by Mack Motor Truck Corp., the A-54S six wheeler is powered by a 158-hp gasaline engine and is equipped with the Mack Balanced Bagie and Power Divider. This same engine is used in one of the other two four-wheeled tractors in the new series, while the third has a 165-hp Diesel unit.

#### ACF-Brill and Foremost Merger Plans Now Off

The proposed merger of Foremost Dairies, Inc., and ACF-Brill Motors Co, will not be completed, according to a recent joint statement by Paul Reinhold, president, Foremost, and C. W. Perelle, president, ACF-Brill.

Spokesmen for the two companies said that although Foremost and ACF-Brill have each been enjoying the most successful periods of sales and earnings in their recent histories, the merger proposals were withdrawn because of difficulties involved in working out the complex details.

#### Cadillac Tank Contract Upped by \$27 Million

An estimated \$27 million increase in its tank contract has been announced by Cadillac Motor Car Div. of General Motors Corp. This latest increase is the sixth major supplement to the Cadillac tank contract since the start of the program on Aug. 15, 1950. This raises the total dollar value of vehicles built or now on order to approximately \$809 million.

The added amount of money is for an additional number of T41-E1 Walker Bulldog tanks. These vehicles have been in production at Cadillac's Cieveland, O., plant since March 27, 1951.

#### Douglas to Announce New Jet Transport

Within several months Douglas Aircraft Co. is expected to announce a jet transport, the DC-8. It reportedly will be powered by four jet engines, carrying between 56 and 80 passengers, and reach a top speed of about 585 mph.

## MEWS of the AUTOMOTIVE

#### GMR Now Occupying New Foundry Unit

General Motors Research Laboratories is now occupying its modern experimental foundry at the GM Technical Center north of Detroit, Mich.

The foundry is equipped with modern laboratory testing equipment for metallurgical research and is set up for experimental melts of all common metals. It also is equipped for pilot plant operations for experimental production.

#### Important Current Projects

The facility was thrown open to the press recently, and exhibits of special projects now underway were on display. These included especially devised equipment and conditions for accelerated corrosion tests of metals; equipment and methods of rapid-wear testing; development of modified zinc die material for short-run dies which reportedly increase their life by 400 per cent; the Aldip process for coating steel with aluminum for heat and corrosion resistance; and develop-

ments in the shell molding process.

Among other projects now under way are work with a wear-resistant powdered iron, a special wear-resistant cast iron which looks so promising that it already is on field test, and a new bronze formulation for bushings with wear-resistant characteristics that is said to be better than any now available.

#### Nash-Healey Sports Car Heads Class at Le Mans

The Nash-Healey sports car took first place in its class and third among all entries in the recent running of the 19th annual Le Mans, France, "Grand Prix d'Endurance" sports car race. Fifty-eight cars started the grueling race, and only 17 finished.

The Nash-Healey captured the Gold Cup award in the 3000 to 5000 CC class, with a Ferrari second and a Talbot third. In the overall event, Mercedes-Benz finished first and second, with the Nash-Healey third, averaging 91.5 mph for 2190 miles over the eight and one-half mile course.

#### Light Heavy-Duty Diesel Announced by Autocar

Autocar Co. has developed a new Diesel-powered tractor, a companion vehicle to a light-weight, gasolinepowered model the company brought out in the heavy-duty field late last year.

While the Diesel, which Autocar has designated Model DC-65-T, weighs only 9750 lb, it is said to have a gross combination rating of 50,000 lb. It is produced in 142-in. and 159-in. wheelbase lengths.

The power plant is a Cummins Diesel with overhead valves. The cylinder block is cast integral with the crankcase and is provided with removable cylinder liners. The engine develops 150 hp at 2500 rpm.

#### Hudson Offers Orlon Convertible Top

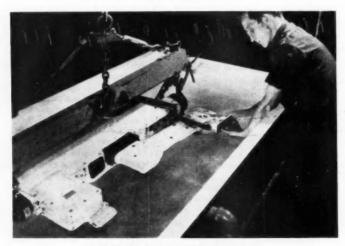
Hudson Motor Car Co. has introduced convertible tops made of "Orlon," an acrylic fabric material that is said to be highly resistant to sun and weathering. It is available as a special option on all Hudson convertibles at slight extra cost.

Chief advantages of Orion are reported to be its ability to stand continual exposure to strong sunlight without appreciable damage, high we or dry strength, and resistance to abrasion and stretch. The material can be easily cleaned with solutions of mild soap or detergents.

#### Maremont Plans to Award Scholarship to Hot Rods

Some deserving "hot rodder" will get a college education at any university of his choice, according to a scholarship plan recently devised by Maremont Automotive Products, Inc.

The plan calls for financial support in the form of a scholarship to be given through an award made at the Bonneville National Speed Trials, "World Series" of hot rods held each summer on the Salt Flats of Utah. The award will be a \$1000 scholarship, which will be given in conjunction with a large gold cup known as the Maremont Trophy. An annual award, it will be bestowed for distinguished achievement in automotive engineering.



#### LEAKPROOF RANGE FINDER

Every T 41 tank range finder produced by Ternstedt Div of General Motors Corp. (see p. 18 of July 1 issue of this publication) for Army Ordnance is immersed in water to defect leaks. Dry nitrogen is sealed into the complex instrument's housing so that temperature changes in the field will not affect operating in M 47 tanks. Gaskets and special sealing compounds, forced into cavities with pressure, make it air tight.

#### AND AVIATION INDUSTRIES

#### Patton 48 is Unveiled at Chrysler Tank Unit

The Army unveiled its newest and most advanced medium tank, the long-secret Patton 48, at the Chrysler Tank Plant, Newark, Del., July 1. Designed by Army Ordnance and Chrysler Corp. engineers, the Patton 48 boasts many innovations which were shown publicly for the first time.

Secretary of the Army Frank Pace, Jr., led the presentation ceremonies at the tank plant before approximately 1000 guests. Robert T. Keller, general manager of the tank plant, K. T. Keller, chairman of the board, and L. L. Colbert, president of Chrysler Corp., also took part in the presentation ceremonies.

The tank also will be in full-scale production soon at the Grand Blanc, Mich., plant of Fisher Body Div. of General Motors Corp., and at the Livonia, Mich., plant of Ford Motor Co. Sizable deliveries from the three sources of supply are expected before the end of this year.

#### British Gas-Turbine Car Hits 152 mph in Trials

A gas-turbine car, built two years ago by the British Rover Co. (see p. 40, April 1, 1950, issue of AUTOMOTIVE INDUSTRIES), recently streaked across the Jabbeke highway between Ostend and Ghent, Belgium, at 152.-691 mph, according to reports.

Since the car was first demonstrated in 1950, a much improved engine is said to have been developed. It now incorporates a heat exchanger to cut fuel consumption, originally much too heavy, to an acceptable figure. The engine is said to be capable of developing 200 bhp at present.

#### Plant, Equipment Outlays to Remain at High Level

Motor vehicle makers expect to continue expenditures for plants and equipment at a high level during the third quarter of this year, according to a joint statement by the Securities & Exchange Commission and the Commerce Dept.

The report said that American business in general has laid out ap-



#### NEW FLYING BOAT HULL

A new flying boat hull bottom, affixed to the wing and hull crown of a World War II vintage seaplane, is shown being taxied over the waters of Chesapeake Bay. Designed and built by Glenn L. Martin Co.. in cooperation with the Novy Bureau of Aeronautics, the research Model M-270 hull is said to embody in full-scale the results of extensive towing tank and wind tunnel tests. White lines check accuracy of former tests.

proximately \$6.4 billion in the second quarter for expansion of plants and equipment, and is expected to spend \$6.1 billion in the third quarter. Capital expenditures for the first nine months of this year may total \$18.1 billion and may exceed \$24 billion for the full year.

#### Studebaker Gets New Army Truck Order

Studebaker Corp. has received a supplemental contract for military trucks and parts totaling more than \$75.7 million. Total of all military contracts received by Studebaker is now approximately \$474 million, of which about \$326 million is still undelivered.

International Harvester Co. also has been given a new contract to build military trucks at its Fort Wayne, Ind., plant. Amount of the order is more than \$3.1 million.

#### AIA Estimates Plane Output Since Start of Korean War

In the two years since the start of the Korean War on June 25, 1950, the U. S. aircraft industry has produced between 9000 and 9500 military planes of all types, according to the Aircraft Industries Association.

It was stated that this production approximately doubles that of 1948 and 1949, the two years preceding the war. AIA pointed out that, instead of 9000 to 9500 planes, the industry could have produced in the past 24 months an estimated 18,000 to 19,000 aircraft under the stimulus of full production, but it would have been necessary to cut deeply into the civilian economy to reach this goal.

#### War Work at Milwaukee AC Plant \$350 Million

Total of Air Force contracts awarded to the Milwaukee plant of AC Spark Plug Div. of General Motors Corp. has risen to approximately \$350 million. Additional contracts, aggregating about \$115 million, have been awarded since last September.

The plant was established in 1948 and produces bomb and navigational computors and gun - bomb - rocket sights. Current employment is about 3200 persons.

## Mews of the AUTOMOTIVE



#### GAS FURNACE

This furnace may be used for annealing wire, rod, and strip products in coils up to 28 in. outside diameter. It may also be employed for post annealing of aluminum die cost rotors, and for many other objects too large for smaller batch type equipment.

borough Air Show this fall. Wright Aeronautical Corp. is reported to have concluded an agreement with Bristol for development of the Olympus in the U. S.

#### Willys Starts Shipment of Plane Landing Gears

Willys-Overland Motors, Inc., has started shipments of military aircraft landing gears less than a year after starting to tool for the project. Conversion of facilities is estimated to have cost \$10 million.

The landing gears are being supplied to Kaiser-Frazer Corp, for use on the C-119 cargo plane.

#### Borg-Warner Acquires Reflectal Corp.

The acquisition of Reflectal Corp., a large producer of aluminum foil blanket-type insulation, by Borg-Warner Corp. was disclosed recently.

Reflectal, with executive offices in New York City and a plant at Hudson Falls, N. Y., will be operated as a Borg-Warner subsidiary.

#### GM of Canada Cuts Prices Slightly

General Motors of Canada, Ltd., recently announced price cuts of \$10 on its car and truck models. The reductions were made possible by a decline in the cost of living and adjustment in wage and salary rates.

#### Electric Furnace Increases Research, Other Facilities

Electric Furnace Co. has announced a sizable expansion of its research and experimental facilities which it says are readily available to serve the metalworking, automobile, and aircraft industries.

One of the most recent additions is a large combination gas and electrically heated production strip line that is said to permit great flexibility in heating, soaking, and cooling rates for annealing, normalizing, coating, and other heat processing of standard-size coils of both ferrous and non-ferrous strip (see cut above).

A second important addition is a gas-fired, special-atmosphere, forcedcirculation, bell-type furnace capable of handling wire, rod, and strip products in standard coils, and many other products in various shapes and forms.

#### New British Jet Engine Announced by Bristol

The Bristol Aeroplane Co. recently announced development of a new turbo-jet engine that is said to be capable of building up a thrust of 9750 lb. This is an official figure, and it is rumored that actual maximum thrust may be much higher.

Called the Olympus, the engine is said to weigh 3250 lb and have a diameter reduced to 40 in. to facilitate flight at supersonic speeds. Reportedly designed mainly to power long-range jet bombers, the engine combines great power with low fuel consumption, according to the company.

The unit is expected to be flighttested within a few months in a Canberra bomber and will probably make its first appearance at the Farn-

#### GERMAN FAIR

A variety of automotive equipment was on display at the Heavy Industries Fair, held recently in Hanover, Germany. In the foreground may be seen a grader with four driving wheels.





#### AND AVIATION INDUSTRIES

#### Chevrolet Turns Out

The Chevrolet Shell Plant in St. Louis, Mo., has produced its five millionth artillery shell under a contract which the St. Louis Ordnance District doubled last December.

Chevrolet operated the Government plant previously in 1944-45, but that assignment was cut short on V-J Day. However, the plant was maintained in stand-by condition, and, as a result, has built twice as much ammunition under the present contract as it built for World War II.

#### Bendix Establishes a Brazilian Subsidiary

Bendix Aviation Corp. has announced the establishment of a wholly owned subsidiary, Bendix do Brasil, Ltda.. in the city of Sao Paulo.

Bendix do Brasil has reportedly been established to render more complete service to its many distributors and customers in Brazil and Southern South America. It will handle the sales and field engineering of numerous Bendix products manufactured for transportation fields and many other basic industries.

#### New Financing Plan Begun by Christiansen Corp.

A new method of industrial financing, which is said to provide the in-



#### **VERSATILE NAVY TRANSPORT**

Inner wing sections are shown going into place in this photo of the Navy's R7Y-1 Super Constellation starting down Lockheed Aircraft Corp's final assembly line. The plane, powered by new compound engines capable of speeds exceeding 370 mph, will be convertible to a 106-passenger transport, 73-litter hospital ship, or treighter.

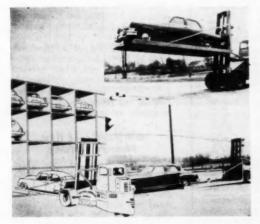
vestor with protection of purchasing power and avail the industry employee of a low-risk investment to serve as a hedge against inflation, has been announced by Christiansen Corp.

The "Christiansen Plan—Inflation Provision Debenture," as it has been named, is a 4½ per cent, 20-year debenture maturing July 1, 1972. The debentures are being issued in multiples of \$100 in an amount totaling \$300,000.

The plan is said to be unique because the value of the debenture at maturity will proportionately reflect changes in the Consumers' Price Index. An escalator provision of the debenture provides for a maximum of 150 per cent and a minimum of 100 per cent. Although, in a period of rising prices, the \$100 debenture can rise to a maximum value of \$150, in a period of falling prices it cannot drop below its original face value of \$100, according to the company.

In addition to providing protection of purchasing power at the maturity date of the debenture, protection is also reported to be provided in the interest payments. While the interest rate itself of 4½ per cent is constant, the actual interest payments will vary in amount with changes in the Consumers' Price Index as determined semi-annually.

The plan is being offered to employees of Christiansen Corp. and its subsidiary companies.



#### EASY PARKING

Evans Enterprises, Inc., has applied the principles of material handling to the parking problem. Under its new system. a large standard hydraulic lift truck picks up a car and deposits it in a plywood cubicle. It is claimed that four cas may be parked in a space formerly occupied by one. The company expects to have the system out of the development stage soon and ready for installation.

## Mews of the AUTOMOTIVE

#### Chrysler Finds Many Uses for Microscope

Secrets of chemistry and metallurgy, and even of medicine, reportedly have been revealed by scientists and engineers of Chrysler Corp. with the aid of the electron microscope.

Discoveries affecting research in such widely differing fields as tissue and cell structure, metal microstructures, brake lining and rubber compounds are said to have been made possible with the aid of the electron microscope used in Chrysler Corp.'s Engineering Div. laboratories.

#### Shock Absorber Bushings

In solving industrial problems, results obtained through use of the electron microscope have been extremely useful. Tests of rubber shock absorber bushings, for example, revealed failures in one type and good service in others. Yet no reason for the difference was apparent.

The electron microscope disclosed that while the carbon black in all compounds of the rubber tested had large particles arranged in a network structure the best compounds contained also another type of carbon black consisting of very small particles. Examination of the sample of poorer rubber revealed only the network containing particles of a large size.

Now, knowing that the carbon black in the compound must be of two types, providing a network pattern of both large and small particles, Chrysler engineers are better able to tell in advance whether a particular compound will work in service or not, and why. Quality control is improved, and good performance of such rubber parts can be assured.

#### Brake Lining Research

The electron microscope is also an important tool in brake lining research at Chrysler. It has, for example, enabled researchers to see, for the first time, how asbestos fibers reinforce the lining material and to visualize the mechanics of the braking operation as it involves the lining.

Electron microscopic studies indicate the changes in brake lining structure before and after braking, thus showing the effect on the lining of heat developed in the braking action.

#### New Car Sales in May Highest Since Sept.

Preliminary tabulations by R. L. Polk & Co. indicate that new car sales in May reached approximately 400,000, the highest mark this year, and the first time that figure has been reached since Sept., 1951. New truck registrations, on the other hand, were expected to show a slight decrease to approximately 71,000, compared with 73,461 in April.

#### British Ford Co. Cuts Car Prices

In an attempt to increase its exports, Ford Motor Co., Ltd., recently announced a reduction of 10 per cent in the price of its cars, 7½ per cent for trucks, and five per cent for tractors. Prices in the domestic market will be reduced five per cent.

The decrease in car prices is said to be the outgrowth of a plan recently announced by the British Government, under which manufacturers with the best export records would get the highest allocations of scarce steel. Simultaneously, a proportion of four cars for export to each one to be sold on the domestic market was fixed. Thus, an increase in exports should benefit car-hungry British motorists as well.

#### Frauenthal Becomes Division of Kaydon Engineering Corp.

The purchase of A. Harold Frauenthal, Inc., by Kaydon Engineering Corp., Muskegon, Mich., was recently announced.

Frauenthal Div. of Kaydon will continue to manufacture multiple-head precision cylindrical grinders and boring and turning machines. It is expected that management, engineering, and production facilities will be greatly enhanced by the merger.

#### GM Adds Four New Films to Catalog

General Motors Corp. has added four new motion pictures to its 1952-1953 film catalog. It now has 52 sound films and a wide variety of educational and entertaining topics available in 16 mm size.

#### 1952 U. S. PASSENGER CAR PRODUCTION

(As reported by the car factories)

	June	one T Way	June	Six Wenths	
-	1952	₹ 1952	1951	1952	1951
Chrysler	11,679	11,734	17,169	67,021	93,585
De Sote	9,483	8,876	13,069	51,103	65,205
Dodge	23,253	22,441 43,458	34,909	132,012	186,429
Plymouth	43,017	43,430	64,568	244,082	375,681
Total Chrysler Group	87,412	86,508	129,705	494,198	720,900
Ford	67,699	68,756	76,564	382.279 *	522,416
Lincoln	2,869	3,455	2,327	15,480	15,386
Mercury	17,477	15,699	19,888	88,193	135,886
Total-Ford Group	88,045	87,910	96.779	465,952	673,466
Bulck	30,021	29,940	37.097	169.072	231.721
Cadillac	8,860	8,839	8,858	47.079	56,136
Chevrolet	81,793	81,696	102.534	461.952	639,614
Oldamobile	21,048	21,101	26,339	119,179	163,321
Pontiac	25,258	25,256	31,346	142,449	196,440
Total-G.M. Group	166,960	106.832	206,174	939,731	1,278,240
Kaiser-Frazer Group	5,780	5,620	4.045	31,874	70.326
Hudson	6,171	6,964	1.208	41,176	73.239
Nash	17,591	16,821	15,364	73.562	93,541
Packard	5,569	5,985	6,433	33.261	45,990
Studebaker	13,164	13,830	16,455	89.224	127,384
Willys	4,567	5.058	1,306	28,844	16,757
Total-All Makes	385,249	395,540	479,400	2,197.822	3,099,853

#### AND AVIATION INDUSTRIES

#### Auto Industry Suffers Much by Steel Strike

At press time, the major part of the nation's steel-producing capacity was still shut down with no agreement in sight as yet on the troublesome union shop issue. The paralysing effects of the strike were continuing to spread through the country in both civilian and defense industries.

In the automobile industry, layoffs continued to spread as inventories of steel ran out. Initial work stoppages were made in parts plants, rather than on assembly lines, as the companies made desperate efforts to turn out every completed car possible before steel supplies ran out. Inevitably, however, shortages reached into the assembly plants themselves, and Ford, General Motors, and Chrysler, as well as the independents, began to lay off workers on the lines.

Similarly, defense production was seriously affected. Oldsmobile, for example, was compelled to halt its output of rockets, while Chevrolet was hard pressed in its efforts to continue production at its St. Louis, Mo., shell plant.

Even if the strike has ended by the time this appears in print, its disastrous effects will be felt for some time in the industry. First, the loss of essential production during the profitable summer buying season will undoubtedly show up in sales figures.

Second, there seems little doubt that 1953 models will be delayed from 30 to 45 days because it must be remembered that, even after a strike is over, there is a lengthy delay before production can be resumed. Finally, there now seems little possibility that the industry will be free of Government controls before the end of 1952, if then, just when it seemed as though they might be relaxed in the near future.

#### Chromium Plating Method Shown at Chicago Affair

A new process of chromium plating over white brass was demonstrated at the recent Industrial Finishing Exposition in Chicago, Ill. The new method, shown by the Chicago Electroplaters Institute, reportedly may be used on automobile interiors.



#### CONVAIR DEVELOPMENT CENTER

The new Engineering Development Center of Consolidated Vultee Aircraft Corp.'s San Diego, Calif., Div. cost \$3 million and contains approximately 236,000 sq ft. It houses a large group of technical personnel engaged in aircraft activities.

#### Ore Shortage May Curb Steel Next Winter

Effects of the steel strike may be felt as far away as next February, even though mills again get going and automobile production returns to normal long before that time.

The reason is that at the time the steel workers left their jobs, workers in iron mines, also members of the USW, stopped work, too. Thus, the flow of iron ore, which normally might have continued during the strike to be stockpiled for use next winter, was practically cut off completely.

The mine worker stoppage comes at the height of the ore shipping season. During the summer months, enough ore is stockpiled to keep mills running during the winter when lake shipments are impossible. It is estimated that more than three million tons of ore a week move to the mills during the shipping season, of which about one-third is put into the winter stocknile.

As a result of the miners' strike, total tonnage moved this year will be cut, and it is conceivable that the shortage will show up sometime next winter. There is a possibility that some of the loss of stockpile ore may be made up through increased use of rail haulage, and perhaps the addi-

tion of some Canadian ships, but it seems doubtful that the whole loss can be recovered.

#### Ryerson Holds Open House at its St. Louis Plant

Some 2600 persons visited the St. Louis, Mo., plant of Joseph T. Ryerson & Son, Inc., recently when the company held open house in celebration of the completion of a large addition to its steel service facilities.

The addition to the plant was begun in March, 1951. It consists of three spans, all heated and completely crane served, providing 50,000 sq ft of additional warehouse space. Total plant and office space of the enlarged plant is now 161,000 sq ft.

#### GM Lists Common Stock on Canadian Exchanges

General Motors Corp. has extended listing of its common stock to two Canadian stock exchanges. Since June 19 the stock has been listed with the Toronto and Montreal stock exchanges.

GM currently has four subsidiary manufacturing units in Canada: General Motors of Canada, Ltd., General Motors Diesel, Ltd., Frigidaire Products of Canada, Ltd., and McKinnon Industries, Ltd.

(Turn to page 124, please)



At this very moment, New Departure's three great plants are turning out thousands of ball bearings for both industry and the Armed Forces—for trucks and tanks, jig borers and jets, household appliances and electronic equipment.

Because all New Departure ball bearings are of the same materials, receive the same heat treatment, are manufactured by the same precision methods, conversion from one to the other at New Departure is largely a matter of changing the emphasis on types and sizes.

Whatever your bearing requirements, feel free to call on New Departure. Its engineers, vast research facilities, and the tremendous capacity of its "guns-and-butter" plants are your assurance of the best possible production schedules.

Nothing Rolls Like a Ball...

NEW DEPARTURE



#### Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manutacturers and Their Suppliers



Sundstrand Machine Tool Co.—B. A. Gustatson has become vice president.

Ford Motor Co. Lincoln-Mercury Div. — R. P. Powers has been appointed general manufacturing manager, while N. S. Brown is now production manager.

Aluminum Industries, Inc.—Eugene F. Eckerle was recently elected general manager, while Richard G. Tessendorf was promoted to assistant general manager in charge of manufacturing.

Holley Carburetor Co. — Danforth Holley has been made a member of the executive committee, and Ralph Sather has been appointed assistant to the vice president in charge of finance. N. A. Miles has assumed the duties of vice president in charge of industrial relations.



Midland Steel Products Co.—William A. McKinley has been elected president.

Budd Co.—Alexander R. Lindsay has been named vice president in charge of research and engineering, while George E. Lallou is now treasurer. J. G. Richard Heckscher has been chosen secretary.

General Motors Corp., Aeroproducts Div.—Norman F. Trost and Colman Eaton were recently made quality manager and manufacturing engineer, respectively.

Standard Pressed Steel Co.—Francis J. Kinsella is now Midwest regional sales manager, while Daniel F. Hulgrave, Jr., succeeds him as manager of the Detroit, Mich., territory.

Ford Motor Co.—J. C. Doyle has been appointed sales and advertising manager. Henry C. Grebe and Victor G. Raviolo have been added to the policy-making engineering board.

American Brake Shoe Co., Kellogg Div.—George N. Decker was recently made vice president.

E. W. Bliss Co., Canton, O.-H. K. Johnson has been named controller.

Goodyear Tire & Rubber Co., Rim Div.—Walter J. Lee has been advanced to general manager.

Wellman Bronze & Aluminum Co.—Benjamin E. Weimer was recently chosen to direct customer relations.



Borg-Warner-International — L. G. Porter and Ray P. Johnson have been elected vice presidents, while Robert A. Brown has been chosen treasurer.

J. B. E. Olson Corp.—Wallace B. Spielman is now president.

Boeing Airplane Co.—George Sanborn has been made assistant to the vice president in charge of administration, while Airo Gonnella succeeds him as director of the Spares Div.

Aluminum Co. of America—Frank L. Magee has been elected a director, while Alfred M. Hunt has become secretary.

F. L. Jacobs Co.—C. S. Jacobs has been elected president.

Sterling Engineering Corp. — Raymond T. Fenn is now chief engineer.



Illinois Tool Works
—Robert F. Dick has
been chosen vice president and assistant to
the president.

Chrysler Corp.—C.

B. Thomas has been elected a vice president of the firm.



Snyder Tool & Enginering Co.—Ei-wood M. Kiefer is now sales engineer.

Cleveland Graphite Bronze Co., Original Equipment Div.—William G. Laffer has been named vice presidentoperations, while Frederick P. Salzman and William G. Hagy are now works manager and comptroller, respectively.

Joseph T. Ryerson & Son, Inc., Alloy Steel Div. — Weaver E. Falberg has been promoted to manager.

Electric Auto-Lite Co., Export Div. -R. H. Melone is now credit manager.

(Turn to page 164, please)

#### Necrology

William L. Lewis, 68, president of Chicago Pneumatic Tool Co., died June 28, in Mount Kisco, N. Y.

Merrill F. Redfern, 51, vicepresident of the Air Transport Association, died June 23, in Washington, D. C.

Luigi Fagioli, 54, Italian racing car ace, died June 20, in Monte Carlo.

Howard C. Little, 55, headquarters treasury staff assistant of Westinghouse Electric Corp., died June 27, in Pittsburgh, Pa.

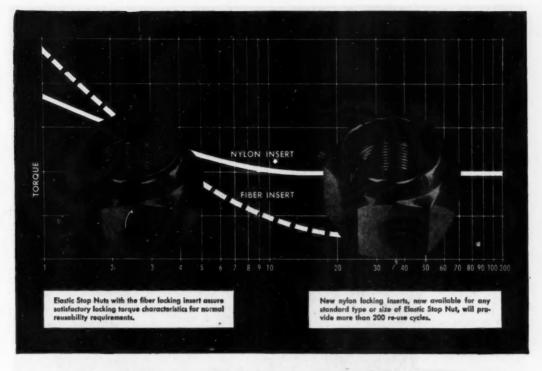
J. A. Shea, 64, advertising staff representative of Goodyear Tire & Rubber Co. of California, died June 26, in Manhattan Beach, Calif.

## Assembly Problem?

Use Black & Decker Screw Drivers for faster work, tighter assemblies, fewer rejects, less operator strain!



\*Trade Mark Reg. U. S. Pat. Off.



#### **How do you measure Reusability?**

#### **UP TO FIFTEEN TIMES?**

For assemblies that must be locked in place, Elastic Stop Nuts with fiber locking inserts guarantee a permanently secure grip—plus ample reusability to cover most normal maintenance requirements.

For assemblies that must be disassembled and reassembled five, eight, ten, or more times during normal use, fiber insert Elastic Stop Nuts make the ideal selflocking fastener.

When an Elastic Stop Nut is run on a bolt, the Red Elastic Collar hugs the bolt—actually makes a skintight fit against the entire contact length of the threads—and this controlled torque firmly resists vibration or

shock. When the Elastic Stop Nut is removed from the bolt, the natural resiliency of the Red Elastic Collar is your guarantee of continuing torque when the nut is reapplied.

FCNA

ESNA TRADE MARK

#### MORE THAN FIFTEEN TIMES?

Now, for assemblies that require constant adjustment or frequent disassembly for checking and maintenance, ESNA offers all standard types and sizes of Elastic Stop Nuts with the new nylon locking inserts.

Reusable up to 200 times with remarkably constant torque characteristics, these new Elastic Stop Nuts offer the one-piece construction, the shock resistance, and the moisture-seal features that many manufacturers now depend upon in the standard Elastic Stop Nuts.

One of these Elastic Stop Nuts is probably the solution to your most troublesome fastener problem. It will pay you to look into the self-locking performance of

Elastic Stop Nuts. For information, write for a new, free booklet. Elastic Stop Nut Corporation of America, 2330 Vauxhall Road, Union, New Jersey, Dept. R5-75.

#### **ELASTIC STOP NUTS**



HIGH



ANCHOR



HIGH TEMPERATURE



SPLIN



CLINCE



CHANNEL



NYLON

NYLON AND FIBER INSERT TYPES ARE QUALIFIED TO SPEC. AN.N.G





The "Steering Engineers" at Thompson's Detroit Division had a big part in bringing to the automotive industry the first major improvement in front wheel suspension in 20 years—Ball Joint Suspension.

The benefits are many—more space under the hood for wider engines ...eliminates front suspension bind ... gives better steering and handling ... increases service life many times ... greatly reduces front end overhaul time ... reduces lubrication points from 12 to 4 per car ... cuts assembly time—on production line or in garage ... eliminates removing front wheels,

#### ENGINEERED STEERING BY THOMPSON...

bushings, draining brakes and realigning wheels when servicing the front end. This is only one of many improvements

This is only one of many improvements in which Thompson's steering engineers have had a major part. Let us solve your steering problems. Our research, experience and manufacturing facilities are always at the disposal of all automotive manufacturers. Call us at WA 1-5010, Thompson Products, Inc., DETROIT DIVISION, 7881 Conant Ave., Detroit, Michigan.

The new ball joint suspension, developed by Thompson Products and Ford Motor Company engineers, made its first public appearance as standard equipment on all 1952 Lincoln car models. It is the most advanced improvement in front end suspension in 20 years.

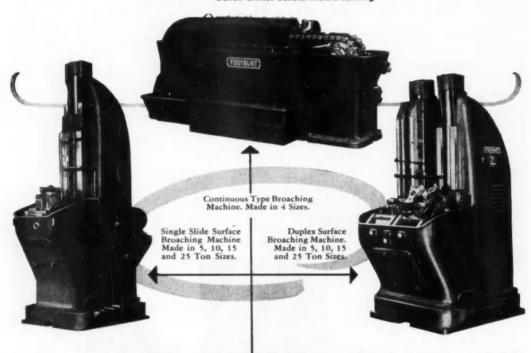
## FOR HIGHER PRODUCTION

## investigate surface broaching for difficult machine work

• Many types of work can be surface broached on Footburt machines at remarkable savings over previous machining methods. High production is obtained with required accuracy and finish. Holding fixtures are designed for quick, convenient loading. Cutting tool maintenance costs are low. We will be glad to work with you on the application of surface broaching.

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### FOOTBURT

surface broaching



Studebaker engineers found the answer in VIC-2-FOLD—the thinnest practical metal-asbestos construction, yet having adequate compressibility for positive sealing. On the engine, VIC-2-FOLD, as shown, compresses to ¾″ while providing maximum breakdown and corrosion resistance. Studebaker's Commander and Land Cruiser models use VIC-2-FOLD head gaskets exclusively.

#### The Sealing Service That Satisfies!

Wherever automotive design calls for sealing with gaskets, shaft seals, or packing, Victor is at your service. For all such applications, Victor offers the industry's foremost facilities for developing and manufacturing sealing products that assure better service and greater satisfaction.

#### THE THIN COMPRESSIBLE METAL-ASBESTOS HEAD GASKET FOR HIGH COMPRESSION ENGINES

Compressible to 3/4" average on engine, VIC-2-FOLD is the thinnest practical encosed asbestos gasket construction, utilizing the high strength of steel and the corrosion-resistence of copper. Note how steel bottom layer is formed up in combustion chamber openings, overlapping copper top layer for maximum protection against breakdowns and blowouts. Inversely, in coolant openings, copper layer is formed down to overlap steel layer, for maximum corrosion-resistance in contact with coolants and anti-freeze solutions.

More flexible than standard head gasket construction, VIC-2-FOLD sealing is equally suited and fully effective on Valve-in-head or L-head engines.

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VICTOR

"ORIGINAL EQUIPMENT"

Gaskets and Oil Seals

#### **Using Automotive Methods**

#### to Produce

#### **Cannon Components**

ANUFACTURE of 90 - mm cannon components by Oldsmobile Division, General Motors Corp., Lansing, Mich., is an object lesson in the prodigious amount of metal removal required in the production of military items. For example, the barrel, which is about 15 ft in length and weighs approximately 2500 lb in its rough-machined state, necessitates the removal of approximately 750 lb of high

tensile steel chips during the sequence of operations. This project also emphasizes two major phases of production development by Oldsmobile. For the most part the special machinery and techniques stem from the advances made in the same plant on similar Ordnance products during World War II. At that time

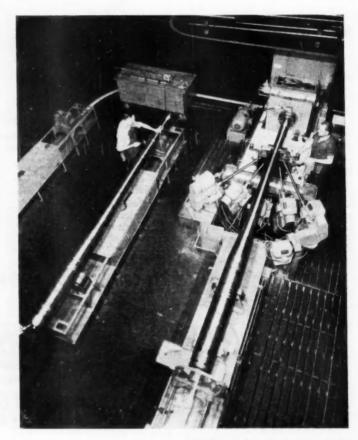
the Lehmann double end lathe and the Thompson special purpose internal surface grinders for the breech recess of the breech ring were unknown. Also, Oldsmobile, working with the machine tool builders, developed turret type automatic broach fixtures to facilitate the broaching of breech recesses. The above mentioned machine tools and techniques are now considered the standard form for manufacturing these items of Ordnance requirements.

The second phase of production development, also to be noted in this article, is found in some items of new equipment and in the form of unique methods and tooling developed at Oldsmobile since the inception of the present 90-mm cannon contract.

The gun barrel is received in the rough, either as a forging or centrifugal casting of alloy steel. The material has extremely high physical properties and exhibits a hardness ranging from 40 to 42 R<sub>c</sub>. While it is a difficult material to machine, the proper selection of speeds and feeds

coupled with a suitable grade of cemented-carbide makes it possible to effect phenomenal rates of chip removal.

The first operation, handled in the long bed Lehmann lathe, provides the basic control for the entire operation. This double-end, double-turret, three-car-



Boring of evacuator holes near mussle end of barrel is done with an Agnew machine which has five angularly mounted Ex-Cell-O heads.

riage machine faces and bores both ends of the barrel and turns four steady-rest spots. This operation assures perfection of alignment since both ends as well as steady-rest locations are machined in the same setting.

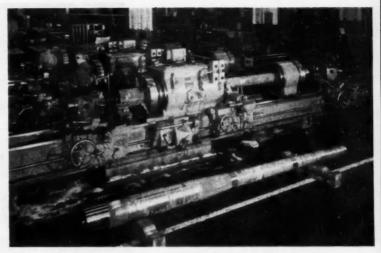
Machining of exterior surfaces of the barrel requires a large number of steps in different lathes, because of the large amount of metal that must be removed. Preliminary roughing is done in one of the LeBlond lathes. with the large diameter end chucked in the headstock, centered at the tailstock, and supported in massive steady rests. A number of subsequent operations are required for finishing the straight and tapered sections. Incidentally, the tapered section involves the major job of metal removal, ranging from 5/8 to one in. from

diameter. Cutting is done with massive, 1½ in. square tool bits, tipped with cemented-carbide.

One of the most difficult operations on the barrel is boring, since the bore runs through a length of some 15 ft and must be done from one end. It takes three passes of the boring bar to complete this operation. In boring, a single double-end tool bit, tipped with cemented-carbide, is held at the extreme end of a boring pack or quill which floats on the end of the long boring bar. Accurate fitting of the quill within the bore provides the support for the cutting tool in its passage through the barrel.

World War II practice, which continued right up to recently, was to use a boring pack fitted with babbitt liners. Unfortunately, this type of tool had a life of only a single barrel. By the time boring was completed, the babbitt was badly worn and scored, required dressing and shimming. A great deal of valuable time as well as expense was involved in the maintenance and replacement of babbitt liners.

More recently, Oldsmobile applied a revolutionary type of boring pack in which the lining is of Neoprene, molded by a custom molder directly on packs supplied by Oldsmobile. This Neoprene formulation has a Durometer reading of 50 to 52. The new tool is good for boring 30 barrels. Besides boosting production and greatly reducing down time, this method releases most of the maintenance crew previously needed.



This double-end, double turret, three-carriage Lehmann lathe faces and bores both ends of the gun barrel and turns four steady-rest spots.

Finishing the powder chamber is another extremely critical operation stemming from Watervliet Arsenal development and World War II practice. At Oldsmobile this is done in a big Bryant internal grinder. The barrel is supported on a center outside the machine and is revolved while the wheel is in action. The chamber is about 25½ in. in depth and comprises three individual tapered sections as well as one straight section. Surface finish for the entire section is specified at 16 microinch. Chamber contour is developed automatically by means of a cam-controlled cycle

Broaching tool end of eight station LaPointe horizontal surface broaching machine.

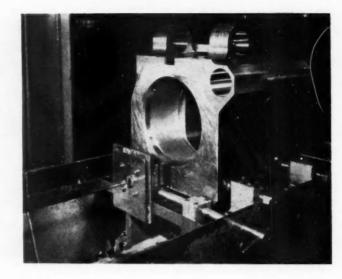


A trepanning tool of special design, installed on an Ex-Cell-O precision baring machine, is used to drill a long, small-diameter hole in the breach ring.

of the grinding wheel spindle. Next is another Oldsmobile machining method developed recently. This is in connection with the boring of a series of evacuator holes around the periphery near the muzzle of the barrel. In all there are eight holes located angularly with a counterbore at the outside surface. The major problem is that each hole must come out on the inside of the barrel absolutely in the center of a rifling groove, thus providing the setting for a neat job of locating drilling heads and assuring adequate rigidity, during the entire operation.

This operation is performed with a special Agnew machine as illustrated here. It will be noted that the drilling is done with a group of five angularly mounted Ex-Cell-O drill heads. Due to the configuration of the bores, as well as the need for step-by-step drilling, each hole requires indexing past the five stations. This machine has reduced the time cycle from hours to minutes and produces a precision job.

The breech ring is another massive element weighing approximately 800 lb rough, calling for approxi-



mately 250 lb of chip removal. This seemingly wasteful excess stock on the exterior is provided deliberately to assure a finished component free from defects. The material is tough and has a tensile strength of 150,000 psi.

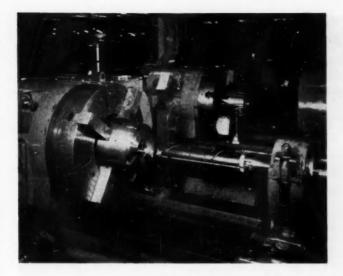
Removing the metal in mass from the cube face is one of the tough jobs. The solution by Oldsmobile was the acquisition of three specially constructed, heavy duty Cincinnati Duplex milling machines. These machines, specifically designed for high speed carbide milling, deliver 50 hp to each spindle, and have a 50

per cent overload capacity. This operation calls for milling cutters ranging from 12 to 18 in. in diameter. Material removal on the cube faces calls for cuts ranging from 5/16 to better than ½ in. on the side and removing approximately 43 lb of metal for each setting. Cutting is done at the rate of 200 to 250 sfpm with table feeds ranging from eight to 10 in. ipm.

The breech ring cavity or recess is roughed out prior to internal surface broaching by various slotting methods, the latest practice at Oldsmobile being the Morton draw cut shaper as illus-



Morton draw cut shaper which roughs out breech ring recess prior to surface broaching.



Production has been increased and down time reduced by use of this Neoprene baring pack in boring interior of the gun tube.

trated. Cutting is done on the return stroke of the draw bar. After this recess has been machined to rough form, the breech ring is placed in the special multistation turret type automatic indexing LaPointe horizontal broaching machine, originally developed by La-Pointe for Oldsmobile during World War II. Approximately 5/32 in. of metal is removed from the various internal surfaces by this operation.

Another development, revolutionary in World War II but common practice today, is the special purpose Thompson surface grinder with a special interna! grinding wheel arrangement for

finish grinding the internal surfaces of the breech ring recess.

has been taken by Oldsmobile in developing a unique automatic machine method for target gun drilling of a long, small diameter hole in the breech ring. The operation is exceedingly exacting since the hole goes through a side wall and yet must be true for straightness, while size must be held to plus or minus 0.002 in. on the diameter.

The basic solution was found in a trepanning tool of special de-

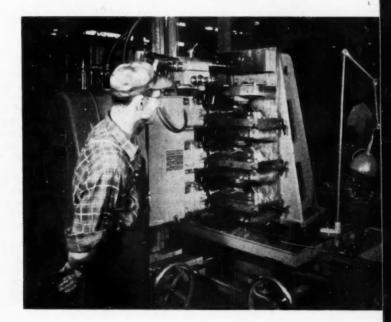
sign. It will be appreciated that one of the difficulties with this job is that the work cannot be revolved. The setup was improvised on an Ex-Cell-O precision-boring machine as shown. The trepanning tool, similar to a gun drill. is revolved at moderately high speed-1200 rpm-but with a low feed-0.001 in. per revolution. An oil pressure stream at 250 psi is carried through the tool to remove

Previous practice was to produce this hole in a toolroom setup. With these methods, it required about five hours of time to drill the hole. Oldsmobile now does it in about 20 minutes.

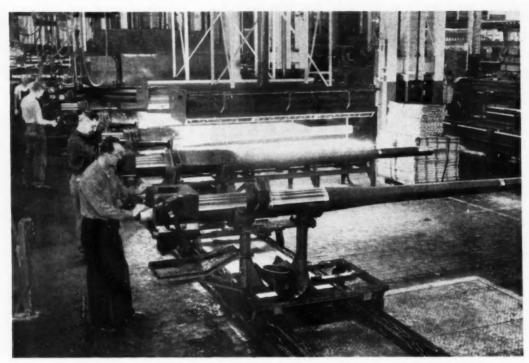
The breech block, too, has received the benefit of automotive methods. Considerable metal has to be removed at both ends in the development of beveling and slots. Oldsmobile employs the versatile and accurate flame cutting method, using a No. 10 Planograph machine.

The cam-shaped groove or slot in the extractor pad of the breech block is produced by World War II

An outstandingly forward step



A cam-shaped groove is cut in the extractor pad of the breech block by this three-sta-tion Pratt & Whitney profiler.



Conveyorized assembly line for 90-mm tank guns showing final inspection and infra-red paint drying oven

method in the three-station, tracer controlled Pratt & Whitney profiler as illustrated, on the preceding page.

The assembly and painting of the completed guns is

done by automotive methods. Paint is sprayed and then dried by infra-red lights and assembly is on a power driven conveyor.

## Electroformed Nickel Finding New Uses

By Paul Silverstone

Chemical Engineer, Super Matrix Co., Inc., Hollywood, Calif.

Those familiar with electroforming know it as a form of cold casting by which intricate parts may be made for use in radar instruments, aircraft functions, molds of various types, etc.

In brief, the procedure in making electroformed parts is usually as follows:

 A core having the inside dimensions of the part is formed. This may be made of rubber, phenolic casting resin, various plastics, sulphur compounds, wax, metals such as aluminum, low temperature melting alloys, etc. Non-conductors are properly treated so as to be conductive and metallic materials are treated for protection from the plating baths.

These materials are then plated with the desired thickness of deposit.

4. The cores are then removed as necessary.

The metals which have lent themselves most advantageously to electroforming are copper, iron, and nickel, the latter metal having been most universally used for this work.

Nickel electroforming can be performed in a variety of baths as given in Table I.

The properties of the nickel as deposited from the different solutions vary considerably, as outlined in Table II.

From the two tables the type of bath which may be used for producing specific properties in a particular electroformed part may be selected.

Specifically, if a part having few recesses but requiring high ductility is to be made, the Watts bath is (Turn to page 116, please)

# Vacuum Testing Automatic Transmission Cases

By J. W. Houser

Warner Gear Division Borg-Warner Corp.

AIN castings for automatic transmissions presented quite a problem at Warner Gear because of possible leaks in the casting. Numerous passageways are drilled in this part. These passageways and the whole casting must be oil tight for satisfactory performance in the end use of the transmission.

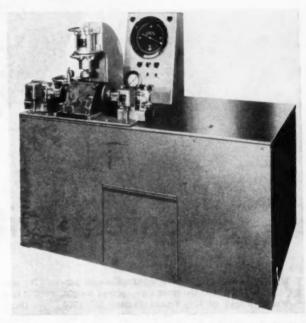
In order to provide satisfactory stock for the passageways and other functions of the case it was necessary to design a number of areas in the casting with comparatively heavy wall thickness.

Due to variations in wall thickness, an occasional defect would be found which would cause a rejection. The casting is complicated and a "lap" or

sand inclusion in the wall is a possibility. These hazards to casting soundness made it imperative that they be tested for leaks. The end use requirements are such that 100 per cent test is necessary to assure satisfactory performance. Vacuum testing equipment manufactured by the Whittington Pump and Engineering Corp. of Indianapolis was selected for determining soundness of the castings.

Primary locations on the casting for subsequent operations are made by machining a counterbore on one end and a large bore in the other end. Then the bottom surface is milled and master location holes are drilled on opposite corners of this surface. The bottom surface and holes are used for location on subsequent machining operations. Straddle milling the end faces on the casting completes the roughing operations.

The casting is tested at this point. It has machined surfaces satisfactory for sealing and a minimum

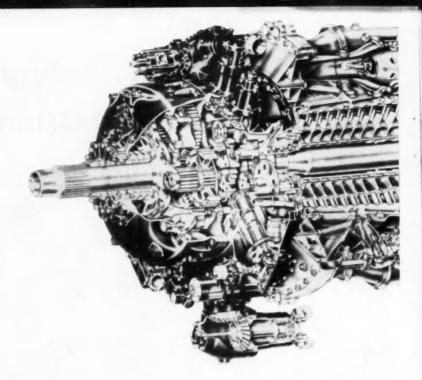


Whittington testing machine with main casting for automatic transmission in place.

amount of machine work has been done before the test. The straddle mill operator unloads the casting from the mill, places it on the test fixture, and starts the test cycle by depressing two push buttons. The part is clamped to the bottom sealing pad by the top air cylinder. A sequence valve operates the air cylinders carrying the end sealing pads. A pressure switch in the line to the sealing air cylinders opens the vacuum valve. Vacuum is drawn on the part until a vacuum switch closes the vacuum valve. A leak in the casting is indicated by "drop off" of the gage hand.

The test operation and straddle milling are combined with very little increase in the overall time. The test machine location is such that the transport from mill to test fixture and test fixture to conveyor is smooth and easy on the operator.

Another primary consideration in the selection of vacuum testing is the fact that the part leaves the (Turn to page 87, please)



### Latest British Proteus

Recent improvements have increased overall performance and at the same time reduced weight and length of the Bristol Proteus III (700 series) turbo-prop engine, according to the latest reports from the Bristol Aeroplane Co. of Bristol, England. The Proteus has been designed specifically

for economical operation on trunk airways, flying at 300 to 400 mph and 30,000 to 40,000 ft.

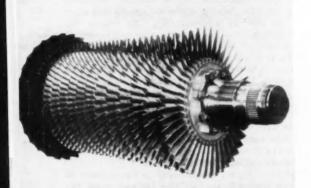
During calibration of the engine, both on the dynamometer and with its propeller on the hangar, the following figures were obtained using a 20 in. final exhaust nozzle:

Compressor rpm	ВНР	Jet Thrust	Specific Consumption Ib/bhp/hr	Specific Consumption Ib/bhp/hr	Jet Pipe Temperature G
11,000	2630	620	0.67	0.62	430
11,500	3350	770	0.62	0.58	455
±12,000	4100	920	0.59	0.55	485

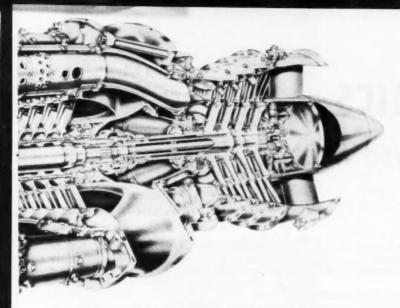
It should be noted that the figures quoted for bhp are those actually recorded on the dynamometer and that the specific consumption is based on these powers only and takes no account of the additional jet thrust quoted.

Fuel economy is achieved by the use of a high compression ratio in conjunction with extremely good compressor and turbine efficiencies, and the reduction of losses to a minimum. All these factors are said to contribute towards a high power output.

The established Bristol feature of the free power turbine is retained because of the advantages it confers. Starter power demand is reduced to a minimum. The engine responds rapidly to the throttle, and pro-



Here is the 12-stage axial compressor which followed by a single contribugal stage, gives the Proteus a high compression ratio.



Bristol Proteus MK 705 propeller turbine engine.

## Propeller Turbine Engine

peller speed can be selected to give optimum power during takeoff and climb and to reduce noise during cruising without affecting the speed of the compresor.

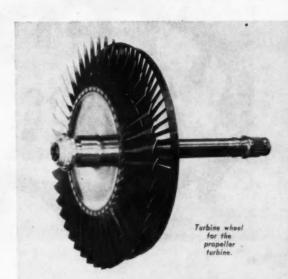
A high compression ratio is achieved by a 12-stage axial compressor and single centrifugal stage. The rotor of the axial compressor is built up from 12 light alloy disks. At each end they are bolted to hollow steel shafts, the whole assembly being held together by eight long high-tensile bolts.

On the 700 Series engines the rotor and stator blades are of steel. The rotor blades have fir tree shaped roots, which fit into grooves in the disks and are kept at correct spacing by distance rings. The compressor casing is cast in halves which are bolted together. Stator blades slide into circumferential grooves of dovetail section in this casing, and are locked into position by rows of wedge bolts inserted in the grooves into which the blade roots are fixed. Air for cooling the turbine wheels is bled off through holes between the roots.

The centrifugal impeller has now been relocated immediately following the last stage of the axial compressor, a modification which has reduced the size and weight of the compressor and also contributed towards its improved performance. The forward or high pressure end of the axial compressor rotor is carried by a hub on which is mounted the single-sided steel im-

peller. Forward again of the impeller the hub is supported in a stacked pair of ball bearings capable of carrying the rotor thrust load. The rear end of the rotor is supported in a roller bearing.

From the centrifugal impeller the air passes tan-(Turn to page 114, please)



### Ease Metal Shortage

A series of new ceramic coatings, achieved through the Solaramic\* process, is Solar Aircraft Company's solution for the problem of high temperature alloy steel conservation.

Through its protective qualities, the Solaramic process provides three important means of conservation of such critical and strategic elements as columbium, cobalt, tungsten, chromium, and nickel—all essential to the rich alloys which are used in the fabrication of turbojet and reciprocating engines which power our aircraft: 1. It greatly lengthens the service life of standard hot parts in the current operating temperature ranges. 2. It allows parts to operate through a standard life cycle at higher than normal temperatures. 3. It allows the substitution of lower alloys, which require smaller amounts of the stra-

tegic elements, with an equal or longer service life.

During World War II the above mentioned metals were under strict Government control, and a study of current reports indicates that we must rely on alloys of chromium and nickel, with the other metals either entirely absent or held to an absolute minimum. The present demand for these metals to meet the high alloy requirements for engine production schedules is staggering when compared to the low stock piles available.

Since the jet engine, with its turbine wheels and blades, combustion chamber liners, and other hot parts contains the highest amounts of these critical and strategic metals, conservation is extremely important if the defense program is not to be curtailed. The present desire of the Armed Forces is to make

all possible reduction in the use of these metals without sacrificing performance.

Some idea of the shortage may be obtained by examination of the critical material indexes: Columbium 600, cobalt 40, tungsten 20, chromium 6, molybdenum 4, nickel 3, aluminum 1. These index numbers. which are qualitative, are multiplied by the per cent in the alloy by lb of alloy in the engine and converted into an index of critical material per lb of thrust. The problem is to obtain maximum life and equal operating characteristics with minimum critical material in-

AISI Type 321 stainless steel



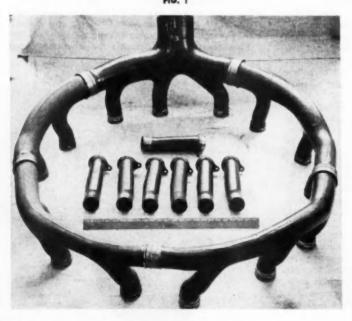


Fig. 1—Each section of this AISI Type 321 stainless steel exhaust collector is protected with a different Solaramic coating. More than 1000 hours at testing have since been logged, and there is no visible evidence at deterioration of the coatings or the base metal.



FIG. 2

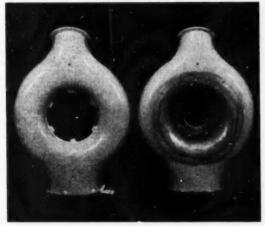


FIG. 3

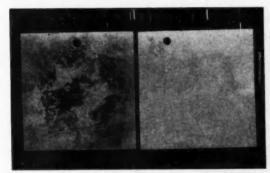


FIG. 4

contains no columbium, cobalt, or tungsten, which are highest on the critical materials index. Type 321 contains the least amount of chromium and nickel in comparison with other high temperature alloys that are used for hot parts fabrication. This is a major reason Solar has stressed the use of this alloy, protected by Solaramic coating, for many applications where previously only higher alloys were considered.

Fig. 2—This 8-31 turbasupercharger nazzle box, protected by a Solaramic coat, has a service life greater than that of the standard nazzle box. At left is shown the box after the coat has been fired on. At right is the part following further assembly of unprotected cold center plate.

Fig. 3—This is a rear view of the nossle box in Fig. 2, with the coated part at left and, at right, the part with additional uncoated cold components assembled.

Fig. 4—After an accelerated corrosion test of only two hours in HNO<sub>3</sub>, plus HF the 19-9 DL coupon on the left is badly deteriorated. The AISI Type 321 stainless steel coupon on the right shows no effects from the same test, thus indicating the desirability of using a stabilized base metal.

In the exhaust systems of reciprocating engines, ceramic coated 19-9 DL components have been used and publicized as a means for strategic elements conservation. Solar, however, has successfully substituted Solaramic coated Type 321 for similar systems, thus eliminating the columbium and tungsten and reducing the required amounts of chromium and nickel.

Such power plant hot parts as combustion chamber liners, transition liners, turbohoods, cross-over tubes, and nozzle boxes usually are fabricated with alloys containing large quantities of the critical and strategic elements. Solar has successfully substituted coated AISI Type 321 for these components, and has greatly extended the service life of similar parts fabricated from the richer alloys, by using Solaramic coatings.

Because of the shortage of the alloying metals, greaf, emphasis has been placed on conservation through the coating of lower alloys to obtain equal life expectancy for the coated part. If, however, these critical and strategic metals were abundantly available, Solaramic could be used for the protection of the richer alloys to allow increased operating temperatures, thus increasing the efficiency and thrust of a jet engine.

Solar has concentrated on the conservation program with a two-pronged attack. First, where it is believed that because of strength considerations, lower alloys cannot be used, we have developed coatings which greatly increase the useful life of the super alloys. Second, where strength is not the prime consideration, we have concentrated on coatings for lighter gauge metal and the substitution of AISI Type 321, with its low content of strategic elements.

This latter application rapidly is finding favor with the Armed Forces and major engine manufacturers. An excellent example of substitution is shown in

Fig. 1. Each section of this exhaust collector was fabricated of AISI Type 321 and protected with a different Solaramic coating for test runs to see how (Turn to page 76, please)

<sup>\*</sup> Trade Mark. Process and coating patents pending.

# *High Speed*Helicopter

Plans for the production of a five-place helicopter of new design have been completed by the Jacobs Aircraft Engine Co., Pottstown, Pa., subsidiary of Barium Steel Corp. This new anti-torque rotor helicopter is the first commercial craft designed for high speed qualities. Top speeds are estimated at between 185 and 190 mph, with cruising speeds of better than 155 mph.

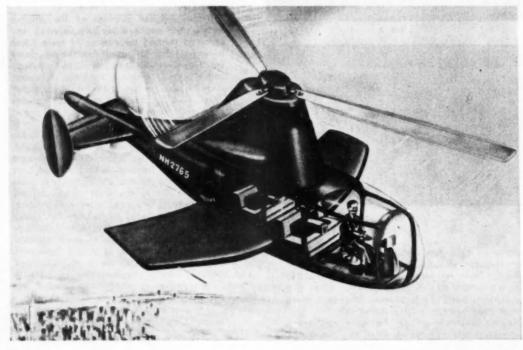
Known as the Model 104, this single-engined, single main rotor, anti-torque-rotor type helicopter uses the Jacobs R-755-E (helicopter modified) engine. The rotor craft is of the gyrodyne type in that a small wing is incorporated as well as a pusher-type propeller which intermeshes with the anti-torque rotor.

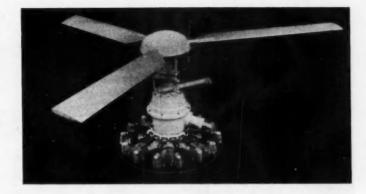
Light weight, high speed, and stability have been achieved by using the Jacobs R-755-E C.A.A. certifi-

cated 360 hp aircooled engine. This engine is being modified for helicopter installation by incorporating as part of the basic engine, a friction and overrunning clutch, the main rotor shaft, the fan, and the main and tail drive reduction gear box transmissions. These engine modifications increase the engine front case length by 10 in. and installed engine weight by 170 lb.

By combining the engine and transmission, it has been possible to provide lubrication for the overall system without requiring additional oil reservoirs and lines. In combination with this, the entire unit is factory built, tested, installed and sealed. This development program has produced an engine-transmission package unit design that is said to be 20 per cent lighter per transmitted horsepower than other comparable horsepower helicopter installations.

The new Jacobs Model 104 high-speed helicopter. The design incorporates stub wings for lift and a pusher-type propeller for forward speed, as well as other new features.





Transmission, controls, rotor unit, and engine are incorporated in a single power plant package.

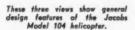
The mid-section of the fuselage has been designed to be of tubular steel with a molded Fiberglas covering. Thus, high strength has been incorporated with a light weight and low maintenance exterior, as a doped or painted finish will be unnecessary. The engine mount and rotor are isolated by Lord-type rubber mounts from the main structure, and the assembly is located above and behind the pilot. The mount, engine ring, and structure are designed to take a 25g crash landing loading.

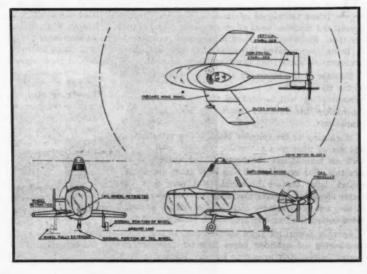
The wings are of 24 ST aluminum alloy and contain the pliocel fuel cells. They are of simplified construction using two spars with an aluminum covering, and are of tapered plan-form. The forward spar is carried to the fuselage, and the wing is connected at four points. Thus, the wing and integral parts may be removed from the fuselage by disconnecting four bolts and the fuel lines. This permits testing of the aircraft both with and without the wing as provision for an integral fuselage tank has been made.

The main rotor consists of three, one-piece extruded

aluminum alloy rotor blades of NACA 23015 airfoil section with a 10-in. chord and 18 ft radius. The blades are connected to an alloy steel hub by means of a non-friction type ball-socket joint. The hub is constructed of two parallel steel plates, and the grease purgable ball-socket joint fits between the plates with the vertical pin connections joining the parts into a simple assembly. Thus, the ball-socket replaces the feathering mechanism and the conventional vertical and horizontal pins. The weight of this type hub is said to be less than one-half the weight of a standard articulated-type rotor hub. The blades are linked together in such a manner as to be positioned equally in the azimuth at the same mean lag angle. Thus, ground instability and hub whirl (ground resonance) are eliminated as the blades are always positioned in their related azimuth positions. Sufficient landing gear damping is used to control ground vibrations.

A 1286 lb useful load and a 1972 lb weight empty give a 3258 lb gross weight; a maximum rate of climb, at this gross weight, of 1530 ft/min is obtained.







Lincoln cylinder head faces are broached in this big Cincinnati surface broaching machine.

# SPECIALIZED MACHINE TOOLS for Lincoln Engine Production

ALTHOUGH production of the Lincoln engine is on a moderate scale, machine lines embody the latest techniques of mass production, feature specialized machine tools of single-purpose and transfer type. Moreover, the Ford principle of Automation is being incorporated throughout, in the automatic transport of parts from one machine to another.

Because of the enormous amount of detail involved in the manufacture of an engine of this character, the present study will be confined to some highlights of machining the cylinder block, cylinder head, and crankshaft.

Machining of the cylinder block is characterized by the use of numerous automatic transfer machines as well as innovations characteristic of current Ford practice. For example, cylinder bank faces are roughmilled, later surface broached. Not only does the latter operation prepare the faces for final operations, it also serves to remove nicks and scratches accumulated during the long trip around the various machines.

Another departure from conventional is the precision-boring of cylinder bores directly from rough boring immediately preceding honing. Honing is done in a large V-type Barnesdrill honing machine, fitted with hydraulically-operated Micromatic Microhone attachments which incorporate automatic sizing honing tools. With this arrangement, each hone operates independently of the others within a given bore and will adapt its cycle to the amount of stock to be removed from a given bore.

Consequently, on any given block it is quite possible to find a number of hones still cycling while others have completed their job. It is only by this means that bores may be held to accurate tolerances and specified surface finish. On the Lincoln engine bores are graded in eight grades in steps of 0.0003 in., the grade being stamp. It each bore after sizing with Sheffield Precisionaire gages. In keeping with present practice surface finish is held to 20-25 microinch (rms).

The flywheel housing is attached to the block at the end of the machine line and bored in accurate alignment with respect to the main bearing line. This is done in a big Heald, two-spindle Bore-Matic. One station does the line boring, the other finishes the face for mounting the transmission square with the bore.

(Turn to page 46, please)

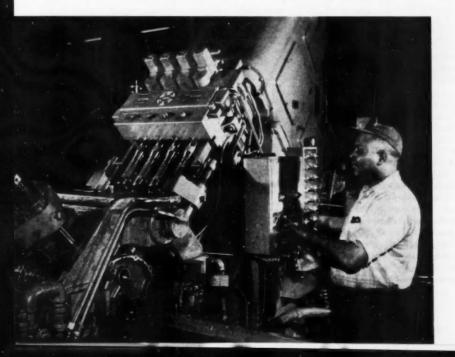


One of the latest examples of Greenlee automatic tapping machines is this fourway machine on the cylinder block.

The Unique, Overhead, J. B. Webb Power-and-Free Conveyor System of Engine Assembly in Conjunction With Final Test Stand Operations on Lincoln Engines at the Ford Motor Company's Dearborn Plant Was Described in the June 15 issue of AUTOMOTIVE INDUSTRIES.

Also Covered in the Article Were Some of the High Spots of Miscellaneous Operations on Piston Pins, Connecting Rods and Other Parts.

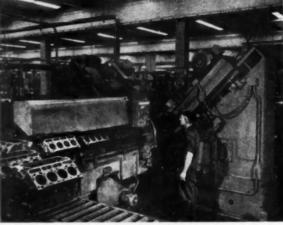
The Present Article Concerns the Setup for Producing the Engine.



#### By Joseph Geschelin

Cylinder bores are finish-honed in the familiar V-type Barnes-drill honing machines, fitted with Micromatic Microsise attachments and hones.





Another touch of modernity is an installation of Cincinnati Flamatic equipment for hardening camshaft gear teeth.

Ex-Cell-O two-way precision-boring machine does the final boring of Lincoln cylinder bores.

The cylinder head line too is completely mechanized and boasts a line-up of special machines and transfer equipment. First operation is done on the now familiar three-station, horizontal Cincinnati surface broaching machine. As in the case of similar machines, described previously in AUTOMOTIVE INDUSTRIES, this one features an enormous broach holder fitted with a multiplicity of individual tool holders with solid cementedcarbide tips. These tools are all interchangeable and readily replaceable. In addition, the ram contains finishing sections of solid cemented-carbide.

A special feature of the machine as tooled for Lincoln heads is the provision of side milling cutters in the fixture at the first station. As the work is clamped the side mills sweep across the ends of the head to provide accurate pad locations for succeeding operations.

The intake manifold too is a noteworthy example of the simplification offered by modern methods in cooperation with design engineers. Starting with the rough casting this part is finished completely and . ready for assembly in a single cycle of a single Cross Transfer-Matic machine.

Another detail of unusual interest is the method employed for hardening the camshaft timing gear. In keeping with advanced practice the gear teeth are hardened to a specified pattern in the Cincinnati Flamatic equipment illustrated here. This technique offers close control of depth, hardness, and hardness pattern through electronic control of temperature and time. However, in view of the design of the gear it was found desirable to preheat the entire piece so as to prevent distortion of the web. Consequently, preheating is done before flame hardening in a special Electric Furnace unit installed nearby.

Coming to the details of the machine lines, the first operation on the cylinder block is rough- and finishmilling of the pan rail face in a large Newton mill, followed by drilling and reaming of two locating holes in a two-spindle vertical Snyder drill to provide for locating in succeeding operations.

Rough- and finish-milling of both ends is handled in an Ingersoll, four-spindle shuttle type mill; roughmilling of banks as well as finish-milling of some lugs is done in a five-spindle, single-station Ingersoll milling machine. An eight-spindle Ingersoll then roughbores the cylinder bores. Camshaft and crankshaft bores are rough-bored in a two-way, four-spindle Natco machine. Next follows the rough- and finishbroaching of bearing seats, widths, and clearance in a tunnel type Cincinnati surface broaching machine.

First of the larger transfer machines along the line is a nine-station W. F. & John Barnes unit for drilling end holes, oil gallery holes, etc., as follows:

#### Station

-Load and 3-Idle

and 3-1018
-FRH head, front; drill 18 holes
-FRH head, front; drill two holes
-FRH head, rear: drill two holes
-FRH head, combination drill and countersink four holes;
drill two holes; ream one hole
-FRH front: drill three oil gallery holes; countersink 14. Idle
-Vertical unit: drill six holes; counterbore one hole

I'll unit-I'dle
Lift unit rear: drill six holes; countersink one hole; drill
three oli gallery holes
8--Vertical unit: countersink seven holes
Lift unit: drill three oli gallery holes; counter-drill six

RH unit; drill 9/16 in. oil gallery hole through -Unload and transfer to gravity roller conveyor

The blocks now are air tested for oil gallery leaks and presented to the 10-station Footburt transfer drilling machine. This one has the following sequence of operations:

#### Station

1. Load work by Automation
2. Vertical, LH side—rough-drill oil pump pad; drill 16 holes in pan rail; drill 10 main bearing cap holes
3. Vertical, LH side—countersink 10 main bearing holes; drill two holes in oil pump pad; countersink 14 holes in oil pan; drill four holes through in main bearings; spot drill one hole drill two holes in oil pump pad; countersink 14 holes in oil pan; drill four holes through in main bearings; spot drill one hole

RH angular unit—core drill two holes; drill three holes

Turn work 90 deg

Vertical, LH unit—ream 10 holes; ream and chamfer one hole; chamfer four holes

RH angular head—spot drill for one hole

RH angular unit—drill one hole

LH unit-rough face front cam bearing Idle

LH unit—finish-bore front cam bearing
RH unit—tap one hole
Top angular unit—drill one hole
Unload onto Automation for next operation

The next stage is a 13-station, Footburt transfer type machine consisting of angular head units for drilling, reaming, countersinking, and tapping both sides in main bearings. At the last station of this transfer machine the block is unloaded by Automation, turned 180 deg with top side up and front end leading and is loaded into the 12-station Footburt transfer type machine for drilling and countersinking bank holes; drilling several miscellaneous horizontal holes; and drilling three other miscellaneous holes.

At the last station the work again is unloaded automatically and transferred into the first station of a five-station Footburt transfer machine tooled for drilling and semi-finish reaming of 16 tappet holes.

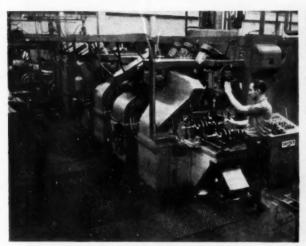
Tapping of miscellaneous holes in the top face and cylinder banks is done in a special Greenlee three-way tapping machine, having 18 spindles. This is followed immediately by tapping in a 53-spindle, four-way

other holes. Following some miscellaneous operations, the camshaft bearing liners are pressed in and the block presented to a five-spindle Natco special boring and reaming machine for finish-boring the cam and crank lines as well as the distributor bores.

The block is inspected off the line, then moves on the conveyor through the Cincinnati tunnel type surface broaching machine for finish-broaching the cylin-

Cylinder bores, previously prepared by rough-boring, are precision-bored in a big Ex-Cell-O two-way, 16-spindle precision-boring machine. They are held to a diameter of 3.7985-3.7995 in., checked with a Sheffield Precisionaire gage.

Tappet holes are finish-reamed in a Footburt, twoway, 16-spindle V-type boring machine. The blocks then move to the Barnesdrill, two-way, eight-spindle V-type honing machine, fitted with Micromatic automatic sizing attachment for honing. Bores are held to a diameter of 3.800-3.8024 in., graded in steps of 0.003 in., with a surface finish of 20-25 microinch (rms). Because of the accuracy and surface finish



Latest version of the Snyder transfer machine method of oil-drilling crankshafts is seen here. A 28-station machine for Lincoln crankshafts, it drills all oil holes as well as lightening holes.



Oil gallery holes and the variety of holes in the ends of the block are drilled in the nine-station W. F. & John Barnes transfer machine shown in the illustration directly above.

Greenlee horizontal and vertical tapping machine which takes nine holes in the rear end, 18 holes in the front end, 15 holes in the bottom face, and 11 holes in the left hand side.

The tapped holes are blown off, the entire block is washed and blown off, then the bearing caps are assembled and the bolts taken up by torque wrenches.

Moving as an assembly, the block is presented to a 12-station Ingersoll cam-and-crank boring machine of transfer type for semi-finish-boring of crank bores, finish-boring of cam bores, and boring and facing requirements for this operation, the machine is equipped with a Barnesdrill magnetic coolant separator for keeping the coolant clean, and an Airtemp liquid cooler to hold the temperature of the coolant to standard conditions.

The block is completely washed in one of the familiar Centri-Spray automatic washing machines, then given a 100 per cent inspection for acceptance. Final step after inspection is to assemble the flywheel housing (where automatic drive is specified) and present the assembly to a large Heald special Bore-

Matic for finish-facing and boring the end of the flywheel housing in line with the main bearing line. Following this the block is given a final wash and is ready for assembly.

It may be noted at this point that all transfer machines mentioned above are served by individual tool boards supplied by Cross, making available two complete sets of pre-set tools ready for installation at each

Cylinder heads are presented in as-cast condition to the enormous Cincinnati two-way, combination surface broaching and milling machine, removing about 0.120 in. of stock on four faces. To assure proper alignment of the work in the fixture, it is located against two spots in the combustion chamber. one spot for horizontal location, two spots in the combustion chambers for lateral location, and against the wall between Nos. 2 and 3 combustion chambers for lengthwise location.

Clamping is done at position 1. At position 2, in the same fixture, milling cutters come in at both ends to finish the locating pads. At position 3, where the fixture is indexed to broaching position, the broaching tool rough- and finish-broaches rocker arm bracket pads, valve guide bosses, intake manifold face, exhaust manifold face, and locating rails. At position 4 the fixture returns to its original position, the head is unclamped and the operator slides it into the turnover fixture at the center.

At position 5 the work is automatically turned over by the fixture, is unloaded and transferred into the second fixture at position 6. Position 7 rotates the fixture for surface broaching of the opposite side. Upon completion of this operation the head is unloaded, inspected completely, and is transferred by Automation to the Natco 13-station transfer machine for drilling, chamfering, and tapping all holes except valve guide holes.

From here the head goes to a special Heald 12station transfer machine for rough- and finish-boring of valve stem holes and valve seat holes, generating valve seats and forming spring seats. The sequence of operations is as follows:

#### Station

- Load
   LH-drill four valve guide holes; hollow-mill four spring seats
- seats
  RH—drill four valve guide holes; rough machine four
  angles above and below valve seat
  LH—drill four valve guide holes; hollow-mill four valve
- LH—drill four valve guide holes; hollow-mill four valve spring seats

  RH—drill four valve guide holes; machine four angles below and above valve seats

  LH—drill four valve guide holes through; machine four angles above and below valve seats

  LH—semi-finish-ream four valve guide holes

  RH—semi-finish-ream four valve guide holes

  RH—semi-finish-ream four valve guide holes; machine angles above and below valve seats

  and 7—Idle

  LH—idle
- RH-semi-finish-bore four valve guide holes and finish four valve seats
- LH-Idle RH—semi-finish four valve guide holes; finish-face four
- LH—Idle RH—finish-ream four valve guide holes
- 11. 11. LH—Idle
  RH—finish-ream four valve guide holes
  12. Unload and move to valve grinding

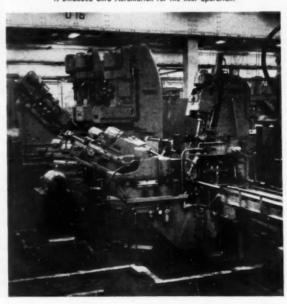
Next the heads are pressure tested for leaks, then proceed to the tunnel type Oilgear surface broaching machine to finish-broach the contact surface and remove all scratches. Heads are then washed, checked for

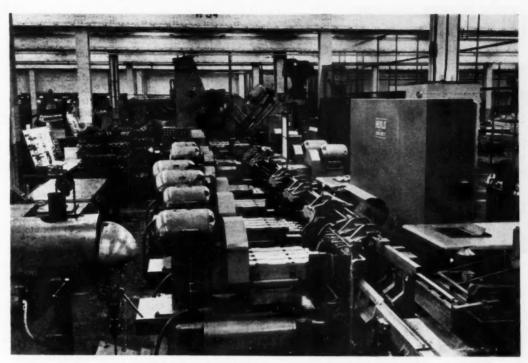
combustion chamber volume by means of a Poole Cavi-

Lincoln crankshafts are given a final inspection in this multiple-column Sheffield Precisionair gage which gives simultaneous readings for 27 controlling dimensions. Crankpins are gaged with hand snaps as shown.



Here is an interesting view of the special 10-station Footburt transfer type machine for drilling bearing cap holes, boring operations, and tapping of the cylinder block. Loading is by Automation, and work is unloaded onto Automation for the next operation.





Perspective of portion of 12-station Heald Bore-Matic transfer machine tooled for rough- and finish-boring of valve stem holes and valve seats.

tometer, and are given their very final inspection.

On crankshafts, rough- and finish-turning on the main bearing line, including oil seal, pulley, and flange OD and facing both sides of the flange is done on a new CF-4 Wickes, double center drive lathe. Then the five main bearing journals are rough-ground in a 16 by 40 Landis five-wheel hydraulic grinder. Rough- and finish-turning of all crankpin bearing surfaces and widths is done in a 6AC LeBlond Duplex lathe.

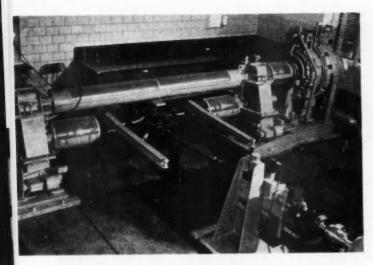
Boring, counterboring, and recentering as well as drilling, reaming, and tapping of the flange end is handled in a special Natco two-way, nine-station, horizontal indexing trunnion type drilling and tapping machine.

Drilling of oil holes and lightening holes, and blow-off are done in a unique 28-station Snyder transfer machine of advanced design. Some of the oil holes are drilled through in one operation; some are drilled in two steps. In any event the machine has a total of 24 spindles for oil hole drilling for the various stations. In addition, three 1½-in. diameter lightening holes are drilled in half-stages, at six stations near the end of the cycle. The last station—No. 28—holds the crankshaft resting on the No. 1 and No. 5 main bearing journals and blows out the oil holes with a blast of air.

This is followed by a series of finish-grinding operations on the main bearing line on Landis plain grinders, and a 16 by 40 Landis four-wheel grinder; and grinding of crankpins in D86 Norton pin grinders. Two keyways are milled in a Milwaukee, two-spindle mill. The shaft then is washed and blown off, and given a 100 per cent inspection. Balancing is done in a GM balancer.

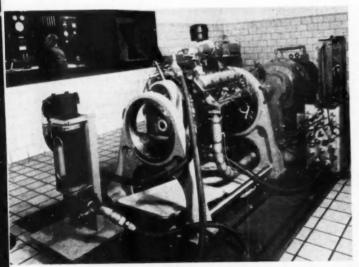
A 12 by 34 in. Gisholt automatic hydraulic lathe is used for finish-machining the pilot bushing retainer seat, flange face and OD, and hub diameter. All main and pin bearing's are polished in a Schraner lapping machine. Finally the shaft is checked for oil leaks in the oil lines, given a 100 per cent Magnaflux test, washed, and subjected to complete overall final inspection.

One of the most noteworthy items of inspection equipment in this plant is the large multiple-column Sheffield Precisionaire gage for checking the crankshaft. As illustrated, this machine automatically sizes all significant dimensions, as well as the relationship among various dimensions. In all it checks at 27 points. The main bearing journals are gaged individually since they are marked in two grades — plus 0.0004 and minus 0.0004 in., for selective fitting of main bearing shells.



Differential gear test unit showing input shaft, differential on test and 2000-hp absorption unit.

# Testing Fuels and Lubricants in Modern Dynamometer Laboratory



Engine test cell and adjacent soundproof control room.

ONSTITUTING one of the most important phases of the activities carried on at the Esso Research Center recently completed at Linden, N. J., the laboratories of the Research Division of the Standard Oil Development Co. are geared to determine the fuel and lubricant requirements of modern vehicles.

Coincident with the development of new and improved fuels and lubricants is the problem of testing their performance under conditions similar to those to be found in ultimate use.

> Final evaluation of new or improved fuels and lubricants must be made on full-scale equipment similar to that of ultimate use. Therefore a building for dynamometer tests was constructed at the Research Center to provide for expansion of testing facilities.

The dynamometer laboratory incorporates all necessary instruments and equipment to follow standard Cooperative Research Council and other special test procedures.

Essentially, the dynamometer laboratory building houses facilities for engine overhaul, assembly and cleaning besides the various test stands. Equipment includes the following facilities:

1. Five multiple cylinder engine test stands with associated control panels, plus provisions for three additional test stands.

Two single-cylinder (Caterpillar) engine test stands with associated control panels, plus provisions for three additional test stands.

3. One gear test stand for performance checking EP lubricants. It can utilize any type car or truck rear end for tests.

4. One transmission test stand (under construction). It will handle conventional or automatic (Turn to page 102, please)

## ASTM Holds

# GOLDEN ANNIVERSARY MEETING



Dr. Harold Lee Maxwell, new president of ASTM

Verything in connection with the Golden Anniversary Meeting of the American Society for Testing Materials was on a large scale. With hundreds of committee meetings, 20 symposiums, and 37 technical sessions, the annual meeting which was held in New York City June 23-27 was a fitting celebration of 50 years of continuous service by ASTM to industry and government.

More than 60 manufacturers of testing apparatus

and laboratory equipment displayed their latest products in 75 booths at the exhibition which was in progress during the week of the meeting, making it the largest event of its kind ever held by the Society. In addition to displays by manufacturers, there were a photographic exhibit and competition which included prize winners in the 1952 Traveling Exhibit of the Science Section, Photographic Society of America.

During the meeting, Dr. Harold Lee Maxwell, supervisor of
mechanical consultants, E. I. du
Pont de Nemours & Co., was installed as president of ASTM,
and Norman L. Mochel, manager, metallurgical engineering,
Westinghouse Electric Corp.,
Lester Branch, was installed as
vice-president of the Society.
New members of the board of
directors are as follows: George
R. Gohn, supervisor Creep and
Fatigue Laboratories, Bell Tele-

phone Laboratories, New York City; William H. Lutz, technical director, Pratt & Lambert, Inc.; Howard K. Nason, research director, Organic Chemicals Division, Monsanto Chemical Co.; Adolph O. Schaefer, vice-president in charge of engineering and manufacturing, the Midvale Co.; and Myron A. Swayze, director of research, Lone Star Cement Corp.

Abstracts follow from three of the many papers presented. (Turn to page 88, please)

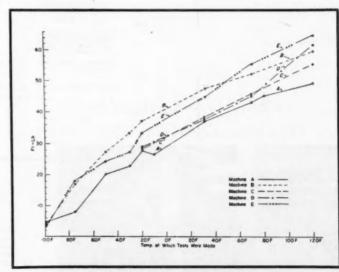


Fig. 1—Keyhole Charpy tests, C1020 steel—normalized, Tests made at variou temperatures on five machines.

## Flywheel Housings In Only Two Machine



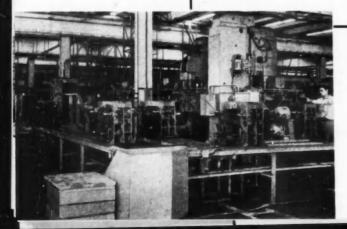
Among the many notable machine lines recently placed in operation in the newly located engine plant of Ford Motor Co. in Dearborn is the compact arrangement for machining Ford and Mercury flywheel housings. A distinctive feature of this layout is that the work is completely finished from the rough casting in just two machine

Close-up of portion of the multi-station Baush transfer machine which completes all machining of Ford flywhel housings.

#### BAUSCH MACHINE

Sequence of Cycle

Station		RH Head	Vertical Head	LH Head
1.	Lead			
		Drill 6 15/32 holes		Drill 4 holes counter-
2.		Drill 3 holes face mill rec- tangular boss		sink one. Rough-bore and chamfer one hale
3		Drill and ream three holes chamfer and tap 3 holes; drill two holes through		Chamfer 4 holes countersink one finish counterbore one hole
4.	Idle			
5		Finish-ream two holes, semi- finish-ream one hole, drill one, chamfer one, rough- bore large diameter		
6.		Finish-ream 3 holes, finish- bore one hole	Drill 5 heles through	
7.	idle			
8.		Tap 4 holes in flange	Chamfer 5 holes	
9.			Tap 5 holes in cover face	Tap 4 holes in trans.
10.	Unload			



Perspective view of Baush transfer machine installation showing the use of individual fixtures, and illustrating the automatic conveyor method for moving fixtures from the unloading station, at the extreme right, back to the loading station. Each of the big fixtures weighs about 700

# Finished Setups

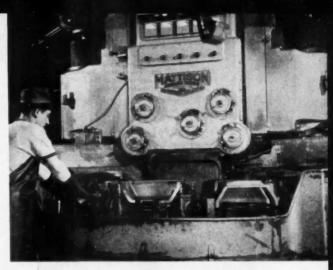
setups—surface grinding and a compact Baush transfer machine of special design.

This housing has three plane surfaces—transmission face, cover face, and engine face—so arranged as to facilitate surface grinding of each one without interference. For this purpose housings are presented to a battery of large five-wheel, vertical surface grinders supplied by Blanchard and Mattison, the Blanchards being No. 22 A5, while the Mattisons are No. 100. In each case the grinder is fitted with three different fixtures and the work is transferred, by the operator, in three indexings to finish the job.

First operation is to finish-grind the mounting face. This face is held to specified limits and is required to be at 90 deg with the cover face. The next fixture location is for grinding the cover face and this, in turn, is held at 90 deg with the face which was ground at station one. Then the part is shifted to the third fixture for grinding the engine face. This face is held accurately with respect to two controlling dimensions and the height is held to 6.14—6.18 in.

Work is then removed from the grinder and placed on a roller conveyor to feed the Baush transfer machine. Apart from unique features of design this machine has several noteworthy characteristics. In the first place, it possesses unusual flexibility for a special machine in that it is readily convertible from a 10-station to a 16-station cycle simply by changing some multiple heads. Thus, while it operates as a 10-station machine for the part illustrated here, it can be readily converted to a 16-station sequence for another part.

The other feature is that the machine is of platen type, fitted with individual fixtures which are moved



Close-up of one of the big five-wheel Mattison surface grinders for grinding the three plane faces of Ford flywheel housings.

progressively from station to station, then out of the machine at the last station. At this point the fixture is transferred to a cross conveyor, and later to a conveyor parallel to the machine. Shuttling of fixtures out of the machine and then back to the first station is done automatically in accordance with the machine cycle.

The fixtures, incidentally, are quite large because of the size of the work, and weigh almost 700 lb apiece. Bulk and weight are important in this case because the part by the very nature of its function is relatively slender and readily deformed in handling and clamping. As a matter of fact this consideration dictated the selection of a palletizing method and a machine with individual fixtures since the work is clamped only once for the entire sequence of operations.

The function of the Baush machine is to mill miscellaneous pads, drill, countersink and counterbore; ream, bore, chamfer, and tap. These operations are performed in the sequence outlined on the preceding page.

Immediately upon completion of the operations listed, the work is subjected to 100 per cent inspection before acceptance for assembly.

## Chemical Treatment Produces Metals from Ore Concentrates

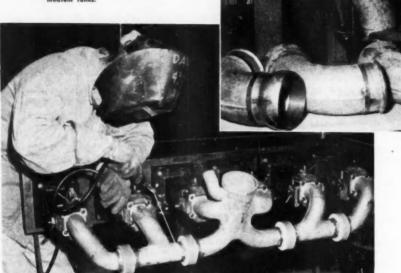
DEVELOPMENT of new techniques which, it is claimed, will drastically reduce current costs of metals production was announced by Chemical Construction Corp. The processes, described as "basically new and revolutionary," involve the treatment of ore concentrates by chemical methods, instead of the usual smelting and refining techniques, to produce pure metals. Several of the many applications are now scheduled for commercial use.

Although extensive fundamental research and development work on these techniques has been conducted in a considerable part of the field of metallurgy, each commercial application requires specific technical adaptation and pilot-scale data for engineering design. In collabora-

(Turn to page 120, please)

Spat-tack welding ball-and-socket assemblies which are used to provide flexible exhaust gas connections between the power plant and chassis of the T18E1 personnel carrier.

Flexible, bellows-type connections are welded into the exhaust manifolds for the 810-hp Continental engine as shown here. This engine powers the General Patton medium tanks.



# Lightweight Exhaust Systems for Tanks and Personnel Carriers

HOUSANDS of complete exhaust manifolds for General Patton tanks are being built by Ryan Aeronautical Co. in one of the largest volume production orders since World War II. These are made of stainless steel and fashioned in the same manner as aircraft exhaust systems. This weight-saving technique is in distinct contrast to that employed with former types of tank engine manifolds which were made of heavier cast metal.

Exacting production techniques are required on the engine exhausts, which are welded by electric arc and gas methods. Each of the 12 exhaust port flange faces must be machined and aligned so that it falls within 0.005 in. of a flat surface. Thermal expansion of the

exhaust system is accommodated by the inclusion of specially designed slip-joints. Consisting of centerless ground collars and tubes, these fittings must be held to a plus zero, minus 0.005 in. outside diameter and plus 0.005 in., minus zero inside diameter, respectively.

For the T18E1 personnel carrier, Ryan builds balland-socket assemblies which are used to provide flexible exhaust gas connections between the power plant and the chassis. These universal joints are a Ryanpatented device which has been incorporated in thousands of aircraft exhaust systems.

Each ball-and-socket assembly consists of a stainless steel tube, flared into a cup at one end to retain (Turn to page 82, please)

## News of the MACHINERY INDUSTRIES

By Thomas Mac New

MAPI Study Answers Criticisms of Accelerated Tax Amortization by Defense Facilities.

#### Tax Amortization Study Brought Out

The Machinery & Allied Products Institute has come up with another fine piece of revealing research. This research study answers criticisms of special amortization and urges the equity of full allowability as a cost. Called "Amortization of Defense Facilities," it provides an effective answer to the charge that accelerated tax amortization is a means whereby industry exploits a national emergency to reap huge gains at the expense of the taxpaver. It analyzes policy and practical considerations regarding allowance of special amortization as a cost in initial government contract pricing, in price redetermination and in renegotiation. On this point the study recommends full al-

In Government planning for any future emergencies, the study may be used as an objective analysis of the role of accelerated tax amortization in promptly obtaining necessary but risky private capital expansion in periods of war and defense emergencies. The discussion of measurement of the cost of special amortization to the Government and to industry will be helpful in assisting individual companies to evaluate the real gains received under special amortization. Copies of the full report may be obtained from the MAPI Chicago office at \$1.00 per copy.

#### **Unique Merchandising Plan**

Westinghouse Electric Corp. has originated a rather unusual merchandising scheme for its Life-Linestarter motor controls. The program, "Dare to Compare," is aimed at both user and resale markets. A unique feature of the program is the blindfold stripdown test which will be performed by Westinghouse salesmen during calls on customers. Starting with a complete unit, the salesman will don a blindfold and will proceed to disas-

semble the control completely. While the unit is being torn down, various design features will be pointed out. At the end of the demonstration, the salesman states his dare claim. Prior to reassembly, the customer will be provided with a check chart that lists desirable features and advantages of any modern linestarter. As a salesman reassembles the control—pointing out construction, operation and maintenance features—the customer may use the check chart to compare the product with that of other manufacturers.

The second major phase of the program involves selected resale manufacturing firms who will participate in an "add-a-part" program. Designed to give prospective customers first hand information of the maintenance and design features of the control, the plan will consist of eight mailing pieces which will break the starter down into seven major assemblies. At any time during the mailing campaign the customer can elect to participate and receive actual sample parts of the control. With the last of the eight mailings, the customer will have assembled a complete

#### **Blackening Theory**

A new theory on blackening of metals, developed in the laboratories of Lehigh University's Institute of Research and Enthone, Inc., was recently reported. The theory is said to explain the reactions in black nickel plating and sulphide blackening of other metals. It is claimed that the theory enables the selection of chemicals and conditions for blackening of metals such as steel (including stainless), zinc and cadmium.

#### New NATCO Drilling Handbook

Due to the great interest in a former drilling handbook, the National Automatic Tool Co. has brought out a revised edition. This is really a most comprehensive work on the subject. Entitled, "Drills and Drilling Practice," it is indexed for quick reference and includes complete information on drills and the drilling of all types of material. Diagrams and tabular enginering data are furnished. NATCO is charging \$1.00 for the 62-page book to defray handling expenses.

#### Gear Index

Volume for the gearing industry was down 11 per cent in May as compared with April. The index figure for May is computed to be 425.9—1935-39 = 100.

#### Gross Up-Net Down

An informal audit prepared by Reliance Electric & Engineering Co. shows that the firm is on the growing list of companies making a greater gross income and earning a lower net profit for 1952. Net sales for 1952 and 1951 respectively show \$19.9 million versus \$15.4 million. Net profits for the two years are \$889,546 and \$904,363 for 1952 and 1951 respectively. The figures are based on a comparative income report of six months ended April 30. The company backlog is reported to be over \$20 million, but orders during the first six months have felt the effect of the defense effort slowdown. According to Reliance president, J. W. Corey, backlog and current orders should result in a continuing high level of operations and shipments reaching well into the next fiscal year.

#### **Company Cooperation**

Bullard Co. has come up with a unique free literature piece in which another machine tool company pays testimony to the Bullard line. In this particular case, it's the Norton Co. story of Bullard spacing tables, written by Norton engineers. FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 65

#### Rolling Fixture for Gear Size and Eccentricity

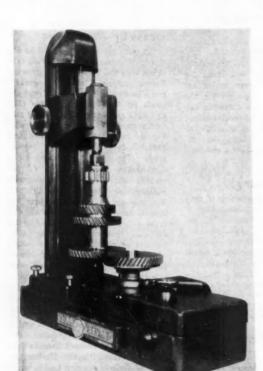
A Red Ring gear rolling fixture with a column type work head is now in production. Its use indicates errors in both size and eccentricity of the work gear, according to the maker. In addition, it reveals any excessive tooth roughness that may exist.

The adjustable work head is set at precise center distance from the master gear spindle carried on a floating spring-loaded slide. When the work gear is rolled in mesh with the master gear the errors indicated above

are read directly on a dial indicator actuated by any movement of the master gear slide.

The upper center is counterbalanced, and is also spring-loaded for loading and unloading. One knob, on the right of the column, is used to raise or lower the center slide. Another knob, on the left, is used to lock it in place. National Broach & Machine Co.

Circle E-1 on page 65 for more data



Red Ring gear rolling fixture.



Fauver check bench for brake light switches.

#### Check Bench for Brake Light Switches

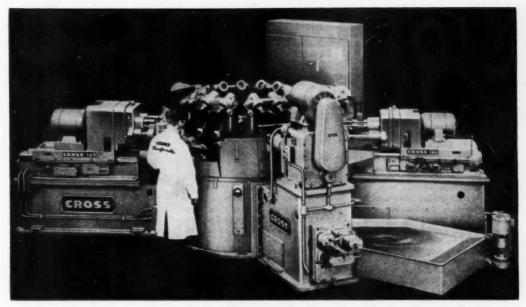
An electro-hydraulic check bench has been designed and built for the checking of brake light switches. These are four major items of test.

Hydraulic pressure of 2500 psi is applied to the tested switch as a pressure breakdown test and to assure seating of the metallic pressure diaphragm. And hydraulic pressure of 130 psi is applied to determine that the switching element makes contact between 60 and 110 psi. Another item is that the switch element during the contact time in test, carry the same amperage as two brake light bulbs on six v battery circuit.

The results of the tests are produced in three-color panel lights indicating bad-low, good, and bad-high. Actual time-study has shown a sustained production rate of 15 parts per minute. J. N. Fauver Co.

Circle E-2 on page 65 for more data

AUTOMOTIVE INDUSTRIES, July 15, 1952



Cross special machine tool for tank parts.

#### Special Machine Tool for Production of Tank Parts

Working on cast armor, Rockwell hardness C35, a special machine tool recently designed drills, chamfers and taps four holes and drills chamfers and reams one hole in tank intermediate and rear wheel arms.

Production of 64 pieces per hour is possible. Of these, 32 are right and 32 left hand arms. This is accomplished through a unique duplex work holding fixture which holds one right and one left hand part in each station.

The machine is a six station power operated dial index, table type. One station is used for loading, two for drilling, one for chamfering, one for reaming and one for tapping. The table is rotated by a fluid motor drive.

Hydraulic and electrical construction is to Joint Industry Conference standards,

Other features include hardened and ground ways, hydraulic feed and rapid traverse, individual lead screw feed fer tapping and Sav-A-Tap spindle construction. Cross. Co.

Circle E-3 on page 65 for more data

#### Attachment for Different Size Drums

A completely automatic, mechanically-operated drum-handling attachment, capable of carrying different size drums two-at-a-time, is in production.

Operation of this horizontal drum handler is completely mechanical. It is attached to the truck by clamping it directly on the forks, and is said to require a minimum of time for either installation or removal.

In operation, the driver tilts the mast backwards and engages the rear hook on each boom of the attachment with the near end of each drum. By moving the truck slowly forward and tilting the mast forward, the front hooks are engaged, while long tension springs keep the rear hooks in contact with the drums. Picking up the load locks the rear hooks for positive grip. To deposit the load, this procedure is reversed.





Yale & Towne Manufacturing Co., Philadelphia Div.

Circle E-4 on page 45 for more data (Turn to page 58, please)



For additional information, please use postage-free reply card on page 65

(Continued from page 57)

#### **Creep Testing Machine**

A lever-arm creep testing machine of 12,000 lb capacity has been developed for testing alloy steels used in high temperature applications, such as jet engines and gas turbines. Known as the Arcweld machine, it was developed by Heppenstall Co.

One of several features of the machine is a power-operated lifting mechanism for the weights used for loading specimens. During testing, the lifting platform automatically positions itself about ½ in. below the weight pan so that the shock of dropping weights is minimized when the

specimen breaks in stress-rupture tests.

For testing at temperatures up to 1800 F. a large furnace with three heating zones is provided. Temperatures in the three zones can be individually regulated from the control panel. The furnace is counter-balanced and a position-indicating scale is provided. A locking arrangement prevents shifting of the furnace during tests.

When used in conjuction with one type of standard controller, specimen temperature has been held within



Arcweld creep testing machine.

one deg at 1200 F. for long periods.

Elongation of specimens may be observed on a dial gage that is mounted on the upper extension grip.

The machine occupies a floor space 43 by 20 in. and is 84 in. high overall. Unloaded, it weighs 1000 lb. Areweld Mfg. Co.

Circle E-5 on page 65 for more data

#### Gear Hobber Features Hob Spindle Redesign



Hamilton gear hobber, No. 1.

A recent change in the hob spindle assembly design of the Hamilton No. 1 gear hobber permits 180 deg rotation of the hob spindle turntable, and reverse rotation of the hob spindle itself, without change of work spindle rotation, or direction of feed. Also, the machine can now use both straight hole hobs and tapered hole hobs with taper either right to left or left to right.

The work spindle and hob spindle can now be reversed independently of each other, and the direction of feed can be changed independent of either. Thus, both conventional and climb hobbing, with either straight hole hobs or tapered hole hobs, can now be done from front to back or from back to front. Hamilton Tool Co.

Circle E-6 on page 65 for more data

#### Silver Brazing Alloy for Carbides

Development of a metal joining composition to be known as EB silver brazing alloy, has been announced. It is primarily intended for use in brazing chromium carbide, cast carbides and other hard-to-wet carbides. Effective results have also been claimed on high tungsten-copper

alloy, cer-mets and other refractory alloys difficult to braze.

The alloy is composed of 57 per cent silver, the balance of the composition includes copper, manganese and tin. It has a melting point of 1120 F. and a flow point of 1345 F.

There are said to be no volatile ele-

ments in this alloy, and it is nonsusceptible to dezincification type of corrosion. It has been used on Type 316 stainless steel subject to dilute mineral acid corrosion. Handy & Harman.

Circle E-7 on page 65 for more data (Turn to page 60, please)

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38 South Dearborn Street, Chicago, 3, Illinois



For additional information, please use postage-free reply card on page 65

(Continued from page 58)

#### Spray Gun Supply Pump

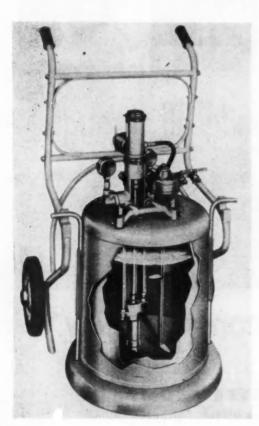
A portable heavy-duty Paintmaster spray gun supply pump that works directly from five or 10 gal original containers has been announced as available. The supply pump can be used as a portable sprayer with the Sta-Level hand truck.

A separate air-operated, dual-bladed agitator is used for mixing the materials—independent of paint pump op-

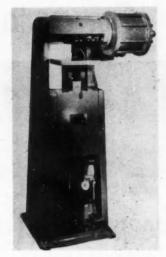
eration. The blades are adjustable to any depth. Aeration is claimed to be reduced to a minimum.

Construction of the pump is said to handle many abrasive-type materials, and it can be used for spraying most of the newer vinyl and plastic base coatings. A 10 gal liner container is provided for special mixing conditions. Gray Co., Inc.

Circle E-8 on page 65 for more data



Gray portable spray gun supply pump.



Matthews marking machine, Series 204.

#### **Marking Machine**

An extra duty, fully pneumatic marking machine is the latest addition to the series 204 marking machines. It has been designed to impress an extra deep mark on tough metal surfaces without exerting extreme pressures and shock to the parts being marked and the marking dies; or where the parts are of such design that they will not withstand the necessary pressure required to make the mark in one pass.

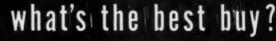
When the control switch at the side of the machine is at the reciprocating position, the table holding the part to be marked moves into marking position. After a timed interval, the head of the machine will automatically pass the marking die back and forth on the part being marked. To compensate for the additional depth of the mark with each stroke of the reciprocating head, the elevating table holding the part is kept under a constant air cushion adjustable up to 6000 lb maximum pressure.

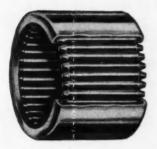
By moving the control switch to standard position, the machine combines the marking possibilities of the other "204" models, enabling it to mark a part with a single stroke of the marking head.

Machine specifications are as follows: Height overall, 56½ in.; Floor space required 22 in. by 30 in.; Operating air pressure 1°7 psi min.; Size of air feed line pipe % in. ID; Electrical current 110-v. single phase, 60 cycle. Jas. H. Matthews & Co.

Circle E-9 on page 65 for more data (Turn to page 62, please)







When it comes to selecting an anti-friction bearing, the best buy is the one that best suits your specific application. Many manufacturers have found that for high radial capacity, light weight or compact size, the Torrington Needle Bearing cannot be equalled at any price.

They have found, too, that Needle Bearings

provide dollars-and-cents savings in assembly, lubrication and maintenance. All this, plus the initial low cost of Needle Bearings, makes them a really outstanding value.

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For additional information, please use postage-free reply card on page 65

(Continued from page 60)

#### **Heavy-Duty Conveyor**

Light in weight and of high capacity, a conveyor — Load-Veyor — has been designed to handle heavy loads. This 12 in. wide heavy duty conveyor is made in five ft and 10 ft sections with 45 deg and 90 deg curves to suit special and individual needs. Ballbearing wheels, two-in. diam and %-in. wide, are spaced on slightly less than three in. centers. Available with welded-on connectors which are interconnectable with the majority of other wheel conveyors of the same size. It can also be supplied with Market Forge removable type connectors.

Weight of a 10 ft section is 69 b. Load-Veyors are rated to take loads of 1000 lb covering the surface of the conveyor and for individual loads up to 300 lb per unit.

Side channel members are joined by inverted angles welded to both side channels. There is one at each end and one in the center on 10 ft sections. This arrangement of inverted angles receives the adjustable stands and also strengthens the frame. Market Forge Co.

Circle E-16 on page 65 for more data





ingersoll-Rand multiple nut runner.

#### **Multiple Nut Runners**

Recently announced are multiple nut runners for running two or more nuts simultaneously.

Tools are all supplied with air from a common backhead, and the air pressure is adjusted so the tools stall at the required torque, all nuts are run to precisely the same degree of tightness. Tools are all mounted in a common fixture. Ingersoll-Rand.

Circle E-12 on page 65 for more data

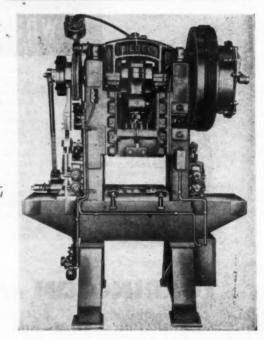


#### **Automatic Stamping Press**

Designed for precision stamping, the 40-ton Di-Matic features include four main crankshaft bronze bearings; an air operated and electrically controlled friction clutch and brake; air ejector and cam; metered lubricating system; cylindrical slide 16 in. diam guided by adjustable retainers with 380 sq in. of contact area.

Other features include a knock-out bar for compound dies — built-in scrape-cutter; five hp vari-drive motor; air clamped roll feed, driven by rack and pinion, with Formsprag overrunning clutch equipped with double ball bearings, and specially designed spring and rubber shock mounts. Di Machine Corp.

Circle E-11 on page 65 for more data



Di Machine 40-ton automatic press, Diebel Di-Matic.

# SILASIIC THE DOW CORNING SILICONE EUSTEE -100\*

# stays elastic ...in oven heat or arctic cold

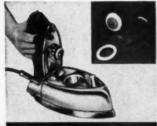
of how Silastic is being used to improve products and to cut production and maintenance costs.

Such applications are practical because Silastic is the only kind of rubbery material that retains its physical and dielectric properties at temperature extremes ranging from —100° to over 500°F. It is most serviceable as a gasketing material at both high and low temperatures and

It is the only resilient insulating material that is not damaged by long exposure to the heat generated in overloaded traction motors. It gives long and reliable service as an insulating material for Navy control cable and for ignition cable in aircraft and ordnance vehicles. Silastic also repels water, and shows remarkable resistance to oxidation and to outdoor weathering.

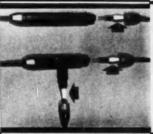
in contact with hot oil.

Silastic has properties that may easily suggest some sales-making ideas or cure a production headache for you. Mail coupon today for new data on the properties, performance and applications for all Silastic stocks.



Silestic seels and gaskets are used to seel steam thembers in demestic steam trens because Silestic is in-soluble in water, edorless, steinless and rasilient of operating temperatures ranging up to 500°F. Life testing and floid experience indicate that Silestic seels will retain their rasilience for the normal service life of the iron.

Photo courtesy Rival Manufacturing Co.



All connections in aircraft antennas used to be individually spliced and tapped. That todious task has been eliminated, and static and corone discharge have been reduced by as much as 90% through the use of "Anstat" fittings equipped with Sitiatic seals. These senis retain their dialectric properties and exclude moisture and dust after long exposure to outdoor weathering and to the full range of ground and stratespheric temperatures.

Photo courtosy Fradric Flader, Int.



Situatic pads and rollers are frequently used to apply pressure in heat sealing equipment, in this machine, for example, a Situatic ring is used to bend committee containers with a ribbon of gold fact, it remains resilient and nonadhesive after long periods of service at surface temperatures above 400 °F.

Photo couriesy Eldon Monufacturing Co.

DOW CORNING CORPORATION
Dept. No. C-19, Midland, Michigen

Silastic Facts No. 10 on properties and performance.
List of Silastic Fabricators.

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Title

Company

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FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 65



#### **Chassis Dynamometer for Cars and Trucks**

Development of a chassis dynamometer, Model C-49, has been announced by the maker. This unit is said to have many major improvements over its predecessor.

The redesigned dynamometer is very compact and can be delivered as a complete unit. Its diagnostic sensitivity and usefulness also have been improved. Heart of the C-49 dynamometer is its completely redesigned power absorption unit. Clayton Manufacturing Co.

Circle P-5 on page 65 for more data



#### Seal for Rear Main Bearings

A positive, two-piece bearing-type seal to prevent oil leakage from rear main bearings of automotive engines has been developed. The seal is made of Hycar rubber.

This seal is oil-resistant and is precision molded into a lip-type seal on a half-circle U-channel metal band. By fitting two of these half-seals around the crankshaft and tightening together, a positive oil seal is obtained. The assembly is similar to that of the bearings. B. F. Goodrich Chemical Co.

Circle P-6 on page 65 for more data



#### Truck Tire Chain

The Roll-O-Matic tire chain principle is now available for heavy trucks and snowplows according to the manufacturer. These units for trucks are not sold as complete chain. The roller assemblies, however, are available which may be attached to the side chain of any truck tire chain.

Two major advantages are claimed through the use of Roll-O-Matic roller assemblies. These are longer cross chain wear; and fast low cost cross link replacement. The roller assemblies are said to be responsible for both in that the roller permits the cross chain to turn thus distributing wear on both sides of the cross link and the rollers permit changing of cross links without tools. Cross links can be snapped on or off by hand. Roll-O-Matic Chain Co.

Circle P-7 on page 65 for more data



#### Caps for Automobile Batteries

To preserve the water in batteries, prevent corrosion and warn of overcharge, a special battery cup has been put out.

The cap, called a Hydrocap, contains a catalyst which converts a battery's escaping hydrogen and oxygen gases back into water. Hydrocaps are sold in a set of three and have been designed in all sizes to fit any make of battery.

Besides keeping water in the battery, the caps prevent corrosion by capturing the corrosive sulphuric acid fumes which commonly escape from batteries.

Heart of the device is the palladium catalyst, which is so constructed in the cap that it captures 95 per cent of the escaping water. Industrial Research Inc.

Circle P-8 on page 65 for more data

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#### FREE LITERATURE

#### **Automatic Drilling and Tapping Machines**

Now available is a bulletin, No. DM100, which describes and illustrates special automatic drilling and tapping machines. Hartford Special Machinery Co.

Circle L-1 on postcard for free copy

#### **Radial Gear Shapers**

An eight-page bulletin, No. 1800-52, describes the improved line of Series 1800 Shear-Speed radial gear shapers. Complete specifications for four models in the line are given, including those for a new Model 18105 shaper with an increased five-in. stroke. Michigan Tool Co.

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#### Filters for Air and **Gas Lines**

Two revised bulletins, SC-1007 and 1008, pertaining to equipment for the removal of water, water-oil emulsions and dirt from compressed air and gas lines have just been released. Selas Corp. of America.

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#### Welding Analyzer

The new Brush welding analyser, which graphically records welding current, electrode force, and other variables in both single and three-phase resistance welding, is described in a single sheet catalog. Brush Develop-

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#### **Precision Test Equipment** & Hydraulic Components

A brochure is currently available which illustrates and describes aircraft and automobile test equipment and hydraulic components. Electric, hydraulic and pneumatic test stands are described. Greer Hydraulics,

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#### **Cutting Tools**

Several lines of standard cutting tools are described and illustrated in a 12-page catalog. Tools covered are of general application made in standor general appression hance a standard and designs and generally available from stock. Gairing Tool Co.

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#### Aluminum and Ferrous **Metal Bonding**

The Al-Fin molecular bonding proc ess is explained in a very comprehensive literature piece. It includes pages on basic design information. Al-Fin Div., Foirokild Engine and Airplane Corp.

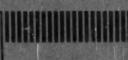
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#### **Valve Servicing**

There is a 32-page booklet, "Synchronized Valve Servicing," that has recently been released. Production and servicing equipment are covered. Waterbury Tool Div., Vickers, Inc.

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**Universal Testing Machines** 

Bulletin 43 gives complete data on a line of electro-mechanical universal testing machines. Tinius Olsen Testing Machine Co.

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Ceramics

General design principles for ceramics are given in a new bulletin. Information is provided on 11 different formulae. Frenchtoson Porcelain

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Cylinder Power

A new technical bulletin called "Cylinder Power in Action" is currently being distributed. The bulletin illustrates 16 cylinder powered moveent and shows 21 actual application otographs. Hanna Engineering

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Salvage Welding Tool and Die

The fourth of a series of "How-To-Weld-It-Better" Manuals, "Tool & Die Salvage Welding," a 64-page, pro-fusely illustrated book on latest welding developments and techniques in this specialized field, is being offered. Eutostic Welding Alloys Corp.

Circle L-13 on nesteard for free care

Set Screws

A new combination catalog and reference book embodying 20 pages of data on set screws has just been insued. Set Screw & Mfg. Co.

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#### USE THIS POSTCARD

**Spacer Fasteners** 

A catalog bulletin, Form 215-A-5M, giving complete information on fasteners for spacer assemblies has been released. Application and engineering data is included. Prestole Corp.

Circle L-16 on posteard for free copy

**Ball Bearings** 

Catalog 528 contains complete specifications on more than 120 different types and sizes of miniature ball bearings. Miniature Precision Bearings,

Circle L-15 on pestrard for free con

**Turbine Blade Production** 

The turbine blade airfoil grinder is completely described and illustrated in a brochure which is now being offered. Specifications are provided. Pratt & Whitney, Div. Niles-Bement-Pond Co.

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**Diesel Engines** 

Four Diesel engines for multi-ser-vice operations are covered in a new brochure. Horsepower, torque and fuel consumption curves are provided. P&H Diesel Engine Div., Harnischfeger Corp.

Circle L-17 on pasteard for free copy

Dies

A 32-page standard die catalog, designed for quick reference, has just been issued. Federal Machinery Co.

Circle L-18 on pastened for free copy

Lubrication Fittings

Published as both a guide to specifying and to speed detailing, a set of data sheets, Form 22-219 A-B-C-D, listing and illustrating all standard models of Alemite lubrication fittings has just been issued. Alemite Div., Stewart-Warner Corp.

Circle L-19 on postenrel for free copy

Winches

A new bulletin describing the ca-pacities and applications of the Gar-Wood Model 2U and 3U low-mount winches has been issued. The 2U which weighs 380 lb has a rating of 15,000 lb while the 3U weighs 375 lb and has a 20,000 lb rating. Gar Wood

Circle L-80 on pastenci for fire copy

**Production Illustrations** 

Graphic or production illustrations to visualize complex machining and tooling sequences and assembly opera-tions are described in a newly published brochure. Welter Production Illustrations.

Circle L-41 on pestencel for free easy

Instrument Sensing Units

The new 42-page 1952 edition of the Whoelco Data Book and Catalog containing up-to-date prices, application recommendations and pertinent information concerning instrument sensing units and associated accessories has just been released. Wheeleo Instruments Div., Barber-Colman Co.

Circle L-M on postered for free copy (See proceeding page)

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#### **Electrically Depressurized** Hydraulic Pump

When hydraulic power is not required during an intermittent duty operation in automatic pressure compensated variable delivery pumps, it is now possible to depressurize the system by shutting off the pump by means of an electrical signal. When the pump is depressurized, input power to the pump is negligible. This is said to result in marked engine power and fuel savings. In one instance, a fuel saving of 700 lb per flight was calculated.

During depressurized operation, the pump operates at rated speed with zero delivery and pressure. The pump returns to automatic pressure compensated operation at rated delivery and pressure the instant the electrical signal is removed.

This feature can be provided on any size Vickers variable displace-ment pump. The sizes of 3000 psi pumps range from 0.32 gpm at 1500 rpm to 23.8 gpm at 1500 rpm. Vickers Inc.

Circle P-1 on page 65 for more data



Vickers electrically depressurized hydraulic pump.



Lear pressurizing kit.

#### **Pressurizing Kit**

A pressurizing kit just designed is for use on aircraft powered by gas turbine engines. The object is to take air with elevated pressure from the compressor section of the engine and convert it into dry, oil-free air for pressurizing radar or other electronic plenums of jet aircraft. Also to discharge a uniform pressure regardless of gas turbine pressure.

Included with the equipment is a 1/15 hp, 27 v, d-c, air compressor with rated capacity of 300 cu in. per min at eight psi absolute inlet pressure and 20 psi absolute discharge pressure. A silica gel dehydrator removes water vapor from the air at the inlet of the air compressor pump. The oil-less pump operates dry. Overall dimensions are 11% by 9% by 7 7/32-in, high. Total weight is 13.9 lb, which includes four-point shock mounting.

Control of discharge pressure is fully automatic as is the control of inlet pressure fed from the gas turbine, so excessively high pressure is never passed on into the electronic equipment. Lear, Inc.

Circle P-2 on page 65 for more data

#### **High Strength Adhesive**

The latest in a series of thermosetting resin compounds, Adhesive A-6, is said to require only contact pressure for joining and cures at room temperatures. A-6 is claimed to be suited for many hard-to-bond metals including the joining of aluminum to aluminum. It has also proved highly successful in bonding a host of other rigid materials to themselves and to each other such as wood, plastics, glass, hard rubber, according to the maker

Curing may be accomplished in one to 36 hr depending on the temperature applied. Bonded materials can be assembled immediately after applying A-6. Shear tests are often said to exceed 3000 psi at room temperature and 2500 psi at elevated temperatures. Because it is a polymerizing, twocomponent system-consisting of a viscous paste and curing agent-very close control over bonding is possible, according to the company announcement. Armstrong Products Co.

Circle P-3 on page 65 for more data

#### **Socket Screws**

A button-head, socket screw, designed for use where streamlined appearance and high strength are wanted, has been put on the market.

The screw, latest addition to the SPS Unbrako line, has a low head with a hexagon socket. It is made of alloy steel and is heat treated.

Button-head screws are made in seven thread diameters: No. 8 (0.164 in.), No. 10 (0.190 in.), 14, 5/16, 16, 1/2 and % in. All except the 1/2 and %, which are produced in the National Coarse series only, are available in both National Coarse and National Fine threads. The different diameters, all threaded to the head. come in four to seven lengths. Standard Pressed Steel Co.

Circle P-4 on page 65 for more data



SPS button-head socket

NEWEST WAY TO FIGHT HEAT, FRICTION, CORROSION, ABRASION

A premium set for late-model cars and trucks

**Best for** oil control even in BADLY TAPERED **QUT-OF-ROUND BORES!** 

CAN'T BLOCK ANY RING SLOT

TWICE THE USUAL BEARING AREA

- for even distribution of pressure
- for easier starting
- for thousands of extra miles

All rings in KromeX Ring Sets are beveled or topered to thread-line contact for quick seating and blow-by control.



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ISTONS . CYLINDER

Sole manufacturers of Krome A Ring Sets, MD-50 Steel Oli king, rull-Flow apring, and Gi-60 Greave inserts. Leading producer of Automatic Transmission Rings and Non-Spin Oil Rings.

### The BUSINESS PULSE

Reports on Personal Income, and Plans for Plant and Equipment Expenditure Strengthen Outlook for High Business Activity Over Remainder of Year. Construction Activity Continues Close to Record Levels.

#### **Effects of Steel Dispute**

At this writing the steel dispute already has resulted in the loss of approximately a full month's output. Yet, except in those industries most directly affected by the curtailment of supply, high operating

levels have generally been maintained. Indeed, in some lines in which demand had been notably sluggish in the early months of the year, there have been signs of improvement in recent weeks. These include textiles, apparel, shoes, and even some types of consumers' durable goods. The prices of basic commodities

second half of the year.

prices of basic commodities have continued to show losses in the last several weeks. By mid-June the index compiled by the Guaranty Trust Co. had fallen to its lowest level since August, 1950. Sales of department stores have been moderately above those a year ago, despite a sharply lower relative level in the New York area reflecting the "price war" that temporarily boosted sales in the late spring and early summer of 1951. Even in the Cleveland Reserve district, which embraces most steel-producing centers, department-store sales registered an appreciable gain in mid-June. At the recent annual meeting of the National Retail Credit Association, most delegates appeared to be cautiously optimistic about prospects for the

The outlook for continuing high business activity over the remainder of the year is strengthened by current reports on personal income, and plans for plant and equipment expenditure. In April personal income was at an annual rate of \$258.9 billion, marking a continuation of the even trend that has persisted since last December. This rate compares with one of \$249.0 billion in April of last year and with a total of \$251.1 billion for the full year 1951.

Planned outlays for plant and equipment for the third quarter of this year total \$6.2 billion. While this is seasonally below the \$6.4-billion figure for the second quarter, it is considerably above the \$5.8 billion spent in the third quarter of last year. If present plans are realized, it is believed that the total for the year will be even higher than the previous

estimate of \$24.1 billion, thus lifting the combined total for the calendar years 1951 and 1952 to the phenomenally high level of over \$47 billion. Some observers feel that businessmen will be hesitant about maintaining this pace and anticipate a scaling down of capital expenditures by late 1953, or perhaps

even sooner. Plans for industrial expansion already have attained a volume sufficient for existing defense objectives, according to the Defense Production Administration, and the Government is therefore planning to stop the issuance of accelerated-amortization certificates. Certificates for about 11,000 projects

with a total value of more than \$21 billion have been granted since December, 1950.

**Employment Rises** 

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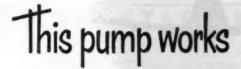
Trust Company of New York.

Civilian employment is estimated to have risen by more than a million from April to May, with the gain equally divided between farm and nonfarm employment. In both cases the increase was primarily sea-

#### Selected Business Indicator



sonal, but the rise in nonagricultural employment is considered significant, since it is the first substantial gain reported so far this year. Total employment in May was 61.2 million, slightly below the level a year (Turn to page 110, please)



### standing on its feet .... or on its head

A "flame-out" is a jet pilot's Number One worry. Flame-out can occur when the pilot goes into a sudden dive, or turns the aircraft topsy-turvy... the fuel "falls" to the top of the tanks away from the single pumping element of conventional pumps, and the engine is starved.

Thompson Double-End Fuel Booster Pumps are designed specifically to maintain uninterrupted fuel flow under pressure from the tank to the engine even when the aircraft is inverted or subjected to negative-gravity conditions.

These pumps are now available in a range of sizes to handle fuel requirements up to 3000 gallons/hour flow. The elements at either end assure continuous pickup of fuel from either the bottom or the top of the tank sump.

Pumps of this exclusive Thompson design are in regular service on current production aircraft.

Technical data and information on Thompson Double-End Fuel Booster Pumps are contained in Bulletin AD-152. Write on your company letterhead to . . .

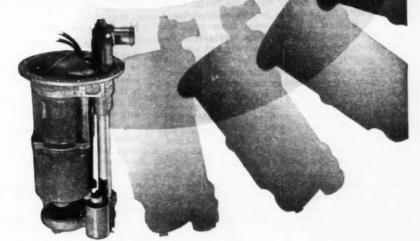


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# AIRBRIEFS

#### By ROBERT McLARREN

#### **Smoke Without Fire**

As is so often the case these days with news from Washington, the recent announcement that the U.S. was preparing to buy foreign aircraft was not only premature but basically incorrect. The announcement, depending upon which version you read, created the distinct impression that the U.S. Air Force was going to buy French, Italian and even British military aircraft to bolster up a claimed sagging U. S., production. Nothing could be further from the truth. In the first place, the entire report is completely false and nothing of this particular nature is going to take place within the near future. In the second place, the U.S. Air Force is not involved in the program at all. It is a plan under which the Mutual Security Administration would place orders for American-designed aircraft with MDAP nations, the planes upon completion being assigned to NATO air forces. The report actually originated from wishful MSA thinking, since the agency (successor to ECA) has long argued vehemently for complete-aircraft procurement from foreign countries, which it feels will strengthen the economy of the country and also increase the country's production potential. The flaws in this argument are pointed up by the USAF, which says that licensing of U.S. aircraft for production abroad will not only reduce production of the same types here now being sent abroad but also quickly dry up the foreign country's capacity for producing its own native-designed aircraft. Much of this discussion stems from the hard-hitting speech given by Prince Bernhardt of the Netherlands before the S.A.E. recently and reported in this column. Bernhardt points out that in the case of his own country, U. S. contracts are only for some spare parts and a continuing maintenance and overhaul program for U. S. military aircraft. He feels that his own country's factories could easily produce complete fighter aircraft such as the Republic F-84 Thunderjet, now being supplied in large numbers by Republic to NATO countries. It is difficult to see how such a program could harm U. S. aircraft production and do other than remove a burden from its obligations but it is equally difficult to see how the badlyneeded machine tools, dies and jigs could be extracted from the present sorely-pressed U.S. aircraft production program without a severe strain. At this writing, however, there is nothing to the story-ether than loose thinking and talk!

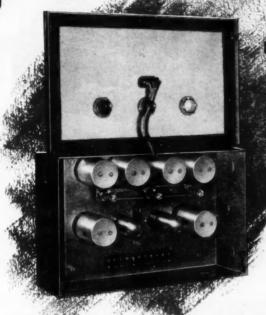
#### **Airlines Slapped**

U. S. airline passengers will never forget or forgive the manhandling they received during World War IIregardless of the reasons behind it. The constantlymounting airline business in the past few months has created-in milder form-some of the conditions of the World War II period and the airlines recently took the first step towards a renewal of their manhandling of that period. The Air Transport Association announced late in June that as of July 1st passengers would be required to call in to the airline at least six hours before departure time to re-affirm their intention of honoring their previously-made reservation. The news had no sooner hit the papers than a storm of protest flooded airline offices and ATA hastily modified the order with the confused explanation that if passengers would leave their telephone numbers (which they have historically been required to do) that the airline would call the passenger six hours in advance of departure. Here was indeed an unreasonable request that placed the burden on the passenger rather than the airline, where it properly belongs. Reason for the original order was the mounting "no show" problem which is plagueing the airlines. We think the simplest remedy for this problem is to refuse refunds on tickets not turned in prior to departure time under a simple "no-how no-dough" policy.

#### No Experiment

Any hopes that civil turbine airliner critics held that the British leadership in this field was merely to be a short-lived experiment should be dashed by the latest reports of firm orders received by British firms in the field. DeHavilland now has orders for 51 fourjet Comet airliners and has completed arrangements with Short Bros. and Harland for additional production of the sleek jet transport. In the turboprop field, Vickers-Armstrong has on hand 54 orders for its Viscount transport and will deliver four to six aircraft per month beginning this fall. Thus, it is apparent that British gas turbine transport leadership has the foundation and strength to continue for many, many years. U. S. experts say that we could not possibly have a jet transport in service before 1956. Some airline spokesmen who have been asked, also tell us we (Turn to page 107, please)

NO AIR STARTING DIESELS



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DICATING SIGNAL LIGHTS

OVERALL CRANKING LIMIT

These control sets are designed for use with the larger air starting engines. The admission of the cranking air is controlled by a solenoid air valve, through the SYNCHRO-START Control Set. One crank of sufficient duration is provided, with lockout after that period to prevent exhausting the air supply. Enclosed plug-in relays and timers are used in these controls for instant service and replacement.

All standard SYNCHRO-START features, such as full safety protection while starting and running; individual signal lights; three-position selector switch; fused control circuits, etc., are provided.

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SYNCHRO-START PRODUCTS, INC.

Automatic Engine Control Equipment

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All-purpose, four-wheel drive automobile made by Alfa-Romeo of Milano, Italy.

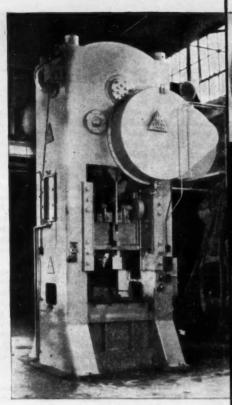
### Alla-Romeo All-Purpose Car Features Four-Wheel Drive

ALFA-ROMEO'S four-wheel drive cross-country all-purpose automobile, designated "1900 AR 52," is powered by a four-cylinder valve-in-head engine with two camshafts. Bore and stroke are 3.25 by 3.46 in., giving a piston displacement of 115 cu in. Output is 65 hp at 4400 rpm. Cylinders and crankcase are one casting with wet liners and the balanced crankshaft is carried on five plain bearings. Connecting rod caps are split at 45 deg to permit being drawn through the cylinder bore; the light alloy pistons carry three compression rings, one of which is chromium plated, and two oil rings. Lubrication is entirely under pressure and is of the dry sump type. The cooling system is pressurized.

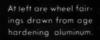
Through the single-plate dry clutch power is transmitted to a four-speed gearbox with constant-mesh helically-cut gears, having synchromesh for third and fourth. A reducing gear and the drive to the front and rear wheels are behind the gear box, and provision is made for a second reducing when the

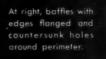
vehicle is used for such slow speed work as snow removal. A rigid axle with semi-elliptic springs is used at the rear, while the front wheels are independently suspended with torsion bar springing. Axles are full floating and a differential lock is fitted. The power take off, from a pulley which can be mounted on either a longitudinal shaft or a cross shaft, is optional equipment. Hydraulic brakes are used on all four wheels, with a hand-operated mechanical brake on the transmission. The body is of the all-metal jeep type, with accommodation for a total of eight passengers, or two persons and 1000 lb of freight.

With a wheelbase of 86.2 in., the Alfa-Romeo has an overall length of 138 in., a tread of 51 in. front and rear, and a ground clearance of eight in. Dry weight is 2750 lb, and maximum speed is said to be 65 mph. It is stated that the vehicle can be water-proofed to operate fully submerged. The standard model can ford 27 in. of water.













At left, steel part drawn 7" deep with heavy embossment in crown.

### VARIETY SHOW

From 13 gauge to one-half inch plate ... From hot rolled steel to age hardening aluminum ... Whatever the task assigned to it, this Clearing 400 ton crankless press has been giving dependable service for more than ten years at Leake Stamping Company of Monroe, Michigan. Clearing presses are built to give dependable performance with low maintenance costs whatever the production requirements may be.

It's always a good idea to look to Clearing for help whenever your production problems involve the forming of metal.

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CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

#### Ceramics Ease Metal Shortage

(Continued from page 41)

the ring would stand up to the service life of such normally used higher alloys as AISI Type 310 and 19-9 DL. Already over 1000 hours have been logged and, to date, there has been no deterioration of either the coatings or the parent metal. Close examination of the coating indicates that many hundreds of additional hours of

operation will be required before any deterioration occurs.

Another interesting example of conservation is the use of Solaramic processed 321 for the hot parts of the B-31 turbosupercharger nozzle box shown in Fig. 2. During World War II these boxes were fabricated of AISI Type 316. Operation of the

boxes in various war theaters, however, showed that this alloy was susceptible to intergranular corrosion, so after the war, columbiumcontaining AISI Type 347 stainless steel was used. However, recently, because of the columbium shortage, the Air Force found it necessary to consider the use of AISI Type 321. Solar was requested to investigate the feasibility of coating this alloy, and it was indicated that a successful trial would lead to the use of a maximum quantity of these boxes fabricated of 321 and protected by the improved heat resistant coating developed by Solar. Application techniques were developed and several test nozzle boxes were coated.

The Air Materiel Command conducted comparative tests on boxes protected by a number of high temperature ceramic coatings. Upon completion of the test schedule, AMC reported that the Solaramic coating remained vitreous and showed the least effect from attack of the leaded fuel. The result: Solar received the first major order for a production run of these parts.

In order to obtain relatively trouble-free operation at high temperatures, jet engine manufacturers have fabricated their combustion chamber liners and transition liners of high alloys. Depleted stocks of the critical metals used to make these alloys demanded an exhaustive search for possible substitutes. Taking into consideration the strength requirement of the parts, Solar research showed that ceramic coated AISI Type 321 would be satisfactory, and recent reports indicate that this combination provides equal or better service life than the high alloy parts. The liner in Fig. 3 is a ceramic processed AISI Type 321 unit. After over 500 hours, examination showed little or no sign of deterioration.

Before recommending AISI Type 321 as the logical base material for ceramic coating. Solar conducted laboratory tests over a period of years. A number of materials, including AISI Type 310, 19-9 DL, N-155 alloy with low columbium content, and 321 were investigated. Each alloy was analyzed not only from a metallurgical standpoint, but also as a vehicle for the Solaramic coating. These tests developed data which satisfied Solar that AISI Type 321 has

(Turn to page 78, please)





# to move more, faster... ho.

The formula for moving any load at higher average speeds, for less, is simple:

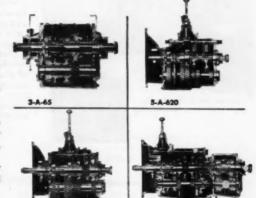
Put your horsepower to work effectively.

Every time you lug your engine, or even let it drop below the maximum efficiency range, you lose profits.

That's why the right transmission for your "road and load" is so important. That's why so many profit-wise operators specify Fuller Heavy-Duty Transmissions, Fuller Auxiliary Transmissions—and Fuller 10-Speed ROAD RANGER® Transmissions.

For the transmission is where borsepower goes to work. And Fuller has proved, time and again, to owner, to mechanic and to driver that Fuller Transmissions gear your rig to use more of your horsepower—to move more, faster, for less.

Illustrated are four of the wide selection of Fuller Heavy-Duty Transmissions. Ask for data on the type and hp, range in which you are interested.



5-C-720

10-8-1120

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Unit Drop Forge Division, Milwaykee 1, Wis. . WESTERH DISTRICT OFFICE (SALES & SERVICE-BOTH DIVISIONS), 1060 E. 11th Street, Oakland 6, Calif.

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### 1000 PARTS PER HOUR in Space 16' x 40'



Unusually compact, this CINCINNATIengineered small parts finishing system has proved to be a major improvement in The George R. Carter Company's production facilities. Complete finishing operations on automobile trim hardware parts are performed efficiently and quickly.

With a minimum of adaptation this Cincinnati system can handle a large variety of small parts. Representative installations have shown savings up to 75% in time and cost.



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#### **Ceramics**

(Continued from page 76)

the strength characteristics at high temperatures, offers the best substitution from the point of conservation, and is most adaptable as a hot part component when properly protected.

Although service tests in highly corrosive atmospheres showed that Solaramic coatings would effectively protect the base metal against intergranular corrosion, certain aspects of installation and operation made it appear that a stabilized alloy would be most effective, and again 321 with its non-critical, non-strategic titanium stabilizing agent became the logical choice.

Operating temperatures of most aircraft hot parts are in the carbide precipitation range of from 1350 to 1550 F, and, since the lead and other combustion products encountered in operating environments accelerate intergranular corrosion, the need for a stabilized alloy can readily be seen. Figure 4, as an example, shows the effect of pickling samples of 19-9 DL and 321 in a nitric hydrofluoric acid solution for only a few hours. The non-stabilized alloy shows decided corrosion, while the 321 is untouched.

The primary requirement of satisfactory coatings is that they afford protection to the metal by stabilizing the surfaces, thus eliminating oxidation and intergranular corrosion. However, there are a number of other characteristics of importance.

Because of the close design requirements for jet engines, parts cannot be redesigned for coating purposes, and the coating must cover the part "as is." During application, because of the complex geometry of the part, it is at times impractical to obtain complete coverage. During handling and manufacturing, there is also the possibility of mechanical damage chipping the coat. Therefore, one of the most important requirements is that the coating be self-healing; that is, at operating temperatures, the coating will seal spots exposed through mechanical damage.

mechanical damage.

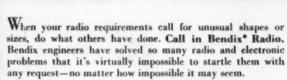
The coating must bond tightly to the parent metal and must be capable of withstanding a certain amount of deformation. It must have a high quality of thermal shock resistance to withstand base metal expansion and contraction, and the thermal stresses developed during operation. It should also withstand the mechanical shock set up by vibratory stresses intro-

(Turn to page 80, please)

AUTOMOTIVE INDUSTRIES, July 15, 1952

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"Let's talk to Bendix. They've solved more and tougher problems than anybody in the radio business."



And, of course, you can always be certain of getting quality products when you deal with Bendix. Their auto radios have been performance-proven on the cars of one of America's largest manufacturers.

If your problem is price or production, Bendix can be of real assistance. They have long been recognized as leading automotive suppliers who understand production line costs and methods.

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BENDIX RADIO DIVISION of



#### **Ceramics**

(Continued from page 78)

duced in operation. In addition, the coating should provide a smooth surface to mitigate surface stress raisers. It should have a high degree of resistance to the attack of combustion products, especially those of lead which is introduced into the fuel to provide a high octane rating.

Solar had these requirements in mind when we set up the standard

test pattern to which coatings are subjected. A few of these tests are:

Thermal shock resistance: (a) Forty-five minute heat to temperature approximately 100 to 200 F higher than operating temperatures to which the part will be subjected, followed by 15 minutes air quench. This is repeated through nine cycles, then the part is given a 15-hour soak at temperature. The entire process is continued through 200 hours. (b) Parts are tested as above for various periods at temperatures of 1850, 1950, 2000, and 2100 F. (c) Parts are

heated to 1700 F and water quenched through 10 cycles.

Bonding and mechanical shock resistance: Coated sample is hit with ball-peen hammer and corners are bent through 90 deg. If sufficient coat is left to protect the sample through 50 hours of thermal shock testing, the coating is approved for further tests.

Accelerated dynamic heating resistance: Coated rolled cylinders which are lapped and spot welded by standard fabricating techniques are subjected to dynamic action as follows: The samples are alternately heated for 15 minutes at 1700 to 1900 F, then air cooled 15 minutes, over a 16-hour period. To warrant further consideration, the coating must protect the base metal with no sign of deterioration.

Other tests are made to determine the coating's resistance to lead bromide, sulfur, and carbon, all found in engine combustion products.

Specific properties of Solaramic coatings which should be of interest from the standpoint of design and production are outlined below:

Impact resistance: Although a sharp blow with a solid object such as a hammer may fracture the coating at the impact area, a thin film remains which will protect the metal. In most instances these spots "heal" themselves during operation and protect the area surface quite as well as would the original coat.

Abrasion resistance: In general, Solaramic coatings resist abrasion well. However, special types of antigail coatings may be applied as a top or second coat over the primary ground coat where excessive friction is anticipated.

Machineability: A coated part may me machined where necessary. A properly sharpened cutting tool will not chip the coating adjacent to the cut. This presently is being achieved at Solar in fabrication of turbo nozzle

Masking: Proper masking with clay allows coatings to be applied to specified areas, leaving masked areas uncoated.

Marking: A ceramic of different color may be sprayed through a stencil as a top coat prior to firing, thus permanently and distinctly identifying the part.

Weldability and weld coverage: The Solaramic coating acts as its own fluxing agent for some alloys. In are welding it is necessary to bare a spot of base metal so the arc can be struck.

(Turn to page 82, please)

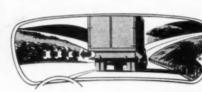


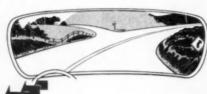
#### Tung-Sol Signal Flashers make Signal Systems Safer!

Flashing lights are commanding. Tung-Sol Flashers provide 3-Way Safety—ahead—behind and on the instrument panel.

Instrument panel pilot light warns of circuit failure by not lighting.

More than 13,000,000 have been used. Most of them outlast the cars they're on.







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SERVICE PISTON RING SETS BY MUSKEGON ARE DESIGNED FOR A SINGLE, SPECIFIC ENGINE!

Like every other part in a new engine, the piston rings are designed especially for that engine. When rings need to be replaced, it is only logical that the service rings should be designed especially for that engine too.

Muskegon Piston Ring Company works with the car manufacturer to design and produce service rings in this manner. As a result, engine and rings are truly "made for each other" and will perform with utmost power and economy.

These Factory Approved and Factory Engineered Service Piston Ring Sets are available only through car dealers and other authorized service outlets.

A set of service rings designed by Muskegon in collaboration with the engine maker\*.

Piston Rings

MUSKEGON PISTON RING CO. MUSKEGON, MICHIGAN PLANTE AT MUSKEGON AND SPARTA

"THE ENGINE BUILDERS' SOURCE"

\*Name on request.

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Gas welding is accomplished with little difficulty.

Repair: Areas of metal which have been exposed by impact, welding, or machining can be patched by cleaning the exposed surface, spraying on additional coating, then refiring. Although the preferred method is to refire the entire section, careful refiring of the affected area without distortion or warping can be accomplished with an acetylene torch.

While Solaramic coatings which have passed high temperature production tests to date are for the super alloys and stainless steels of the AISI 300 and 400 series, coatings for applications on such materials as SAE 1010 and 1020 and the NAX series are being developed. Type tests indicate promising results and it appears that soon these metals will be used in the higher temperature ranges

if design improvements make such applications practical.

Solar recently licensed the Ferro Corp. of Cleveland to manufacture and sell Solaramic frits, and both companies are continuing extensive research and development of ceramic coatings.

#### Lightweight Exhaust Systems

(Continued from page 54)

a cast metal ring which is circular in exterior contour. Inside this "ball" another stainless steel tube is inserted and flared to fit snugly, forming an integral joint which permits angular movement in all directions.

For the T18E1, Ryan provides two types of these assemblies: a three-in. diameter joint and one which is 4% in. in diameter. In the smaller unit, the cast hall is made of Ni-resist.

In the larger assembly, the case ball is made from a new alloy, especially formulated by the Ryan development laboratory. Named "Ryanalloy," this newly-devised metal has been specifically created to meet the exacting requirements of ball-and-socket joints. It will withstand oxidation at elevated temperatures running to 1800F.

The high efficiency of the joint is attained by precision machining the cast balls and closely fitting them within the stainless steel tubes. It requires top caliber tooling to accomplish this in the punch presses. Both end and side clearances between the ball and tubes must be carefully controlled to provide flexibility but prevent gas leakage.

By design the coefficients of expansion of the cast balls and the stainless steel tubes are similar. But the clearances in the joint are specified to take advantage of the differences in temperature between the inside and outside of the assembly. Since the joint is relatively thick, with the ball acting as a partial insulator, there is a difference in temperature between the ball and the inside and outside tubes. As the joint heats, the ball expands more snugly into the socket to form a leak-resistant joint. At cold temperatures, a greater clearance is available to permit more freedom of movement during engine warm-up.



#### AUTOMOTIVE INDUSTRIES . . .

is your News Magazine of Automotive and Aviation

MANUFACTURING

## Production Pointers

TIME-

IDEAS



### GISHOLT

Presented as a service to machine shops, we hope some of these interesting ideas, culled from thousands of jobs, will suggest ways to help you cut time and costs in your own metal work.

#### HOW TO DO FAST, ACCURATE MACHINING OF MOTOR FRAMES

#### No. 12 Hydraulic Handles Variety of Sizes

Here is an excellent setup for machining electric motor frames in a variety of sizes ranging from 630 to 204 frames. The job is done on a No. 12 Hydraulic Automatic Lathe with both ends of the frame machined at once.

Simultaneous machining of the two rabbet fits assures a minimum and uniform air gap. It also means the end bells are concentric, parallel and in perfect alignment.

#### **One Automatic Operation**

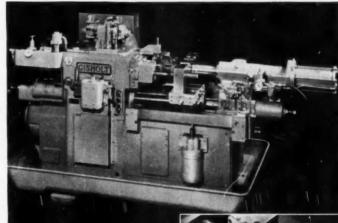
The frames come to the No. 12. Hydraulic with motor windings in place. The parts are quickly located and held by an air-operated mandrel. Tools on all four slides complete the rabbet fit and facing of both ends in one automatic operation. Floor-to-floor time on all motor frames is low, with the 204 frame (8\%" stator) handled in only .7 minute with carbide tooling.

The job is planned for rapid changeover with tool slides having individual tool adjustments for handling the full range of frame sizes.

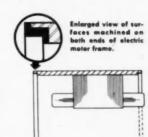
Fast, steady output of a variety of motor frames is provided by the No. 12 Hydraulic—with further savings coming from its extreme simplicity of setup, operation and maintenance.

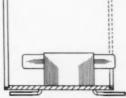


You'llgeta good look at the No. 12 Hydraulic Automatic Latherits versatility and speed—when you have this complete new catalog. In it are full information and specifications plus photos and facts on 28 different jobs! Write for it today.



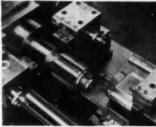
The No. 12 Hydraulic for machining electric motor frames.







No. 12 Hydraulic with part chucked



Tool setup of No. 12 Hydraulic with air-operator



TIME-SAVING IDEAS

#### CONTOUR BORING WITH C/F TURRET LATHE

#### **Work Done with Special Cam Plate** in Standard Taper **Attachment**

This 3L Saddle Type Turret Lathe is busy at top priority work in our nation's big jet engine program. The part is a turbine nozzle support, still high on the restricted list.

However, it's no secret how the cross-feeding turret and taper attachment of this turret lathe solved the problem of boring a special I.D. contour. Instead of a conventional guide plate, a special cam plate is inserted in the standard taper attachment. A cam follower on the cross feeding hexagon turret follows this guide while the stub boring bar completes the contour boring. After completing the cut, the follower can be instantly disengaged from the hexagon turret for straight turning and boring work.

There's a four-page picture story that shows how unusual turret lathe tooling and setups are producing vital turbojet engine parts. Ask for "Turret Lathes Build Turbojets."



Turbine nozzle support is machined from row forging.

Setup for machining I.D. contour of jet engine turbine nozzle support. Note special cam plate in taper attachment.

Single special cam plate adapts standard turret lathe for contour boring work.

> Steel forging and finished

bushing after removel of

one-third of

original metal.

#### HE'S DOING IT THE RIGHT WAY

#### **Both Turrets Working at Same Time**

There's a reminder in this photo for all of us . . . and that is to watch every turret lathe job for the opportunity to do simultaneous machining from both

The part here is a bushing. It's machined on a No. 5 Ram Type Turret Lathe from a steel forging by wellplanned but simple tooling. Rough turning, rough and finish boring and chamfering are all handled from just two faces of the hexagon turret. While this is taking place, tools on the quickindexing square turret do finish turning, rough and finish facing and forming.

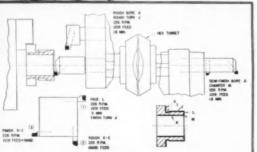
Thus, through the simultaneous use of both turrets, six surfaces are machined on this 51/8" steel forging in only 5.4 minutes floor to floor. If only one turret were working at a time, the job would take far longer.

Simple multiple tooling on the hexagon turret, plus simultaneous machining from both turrets, means real efficiency on this job.



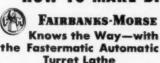
This close-up shows how both turrets are working at same time in machining bushing.

Tool selup for machining bushing.





#### HOW TO MAKE BIG SAVING ON MEDIUM RUNS



Here's another case that proves you don't need big runs to take advantage of the economies of the Fastermatic Automatic Turret Lathe. This time it's at work for Fairbanks, Morse & Co., producing a variety of flywheels in lots of 100 for their famous one-cylinder gasoline engines. The job is set up this way:

Station 1—Core drill, rough the O.D. and rough face the hub while rear cross slide straddle faces the rim. 2—Rough the bore and finish the O.D. while front cross slide finish straddle faces the rim and 1/16" radius. 3—Face the hub with turret facing attachment. 4—Finish the bore. 5—Face spokes for pulley fit with turret facing attachment. 6—Ream the bore.

With this medium run job now handled on the Fastermatic Automatic Turret Lathe, there are no longer the delays in assembly which minor errors of hand operation



Typical flywheels machined on the one Fastermatic. TIME-SAVING IDEAS

Fastermetic set up for machining castiron flywheels.

caused. Man power is more productive because one operator can run two or more machines.

The faster production and greater accuracy of the Fastermatic, with one man operating two machines, make possible big savings on medium runs.



#### NINE DEEP GROOVE CUTS IN ONE OPERATION

### Simplimatic Automatic Lathe Simplifies the Job

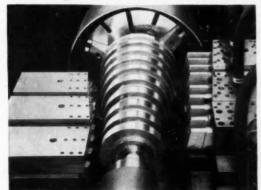
The part you see here is an allimportant compressor rotor for a well-known jet engine. Accuracy and high production are good reasons for giving the job to the Simplimatic Automatic Lathe.

The nine grooves between the

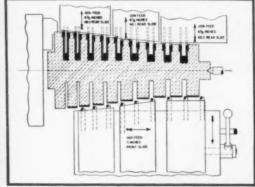
stages must be widened carefully. To do this, twenty-seven grooving tools are mounted in three rear slides. These have a common drive and are arranged so that only one slide is cleaning up at a time. This avoids excessive tool pressure.

Tools on the single front slide turn nine diameters with automatic approach, feed and return. Tools are fed laterally to machine all stage diameters except the large holding diameter. The front slide is then manually retracted to provide unloading clearance. Floor-to-floor time is an even nine minutes.

With 36 tools on front and rear slides, this Simplimatic accurately machines these difficult parts in one chucking.



Tooling on front and rear slides for machining compressor rotor.



Tool arrangement of Simplimatic for compressor rotor job.



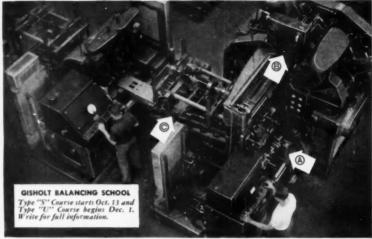
#### NEWEST IN CRANKSHAFT BALANCING

**Amazing Machine is Ultimate in Automatic Operation** 

TIME-SAVING IDEAS

Wonders never seem to cease in this important field of balancing-as proved by this special DYNETRIC Balancing Machine now on the job for a large automobile manufacturer. The machine handles V-8 crankshafts. Here's the way it operates:

- 1 Crankshaft is inserted in machine, and operator measures and locates unbalance. This data is electrically transmitted to 1st correction driller.
- 2 Crankshaft is conveyed into driller where correction is automatically made on basis of data received from Balancing Machine. Meanwhile, unbalance in next crankshaft is being measured and located.
- 3 With 1st drilling completed, crankshaft is automatically carried to 2nd balancing stage. This "unloader" serves as a storehouse, holding up to 7 crankshafts as a reserve in case of line stoppage.
- 4 Second operator measures and locates any unbalance remaining after 1st correction and makes final corrections with small driller.
- 5 Crankshaft moves to 2nd "unloader" and on to assembly line for Superfinishing.



Crankshaft enters machine at (A), is balanced and moves into driller (B) for correction. It then 'unloader" (C) to 2nd machine for final balancing.

Production is 40 balanced and inspected crankshafts per hour.

While this is a special machine for automotive work, Gisholt balancing equipment is adaptable for virtually all balancing problems-high production or not. Write for 6-page reprint, "Continuous Crankshaft Bal-ancing," giving the full story on this crankshaft job.



#### CAMSHAFT BEARING SURFACES GIVEN LONGER LIFE BY SUPERFINISHING

#### **Five Surfaces Superfinished** at Once at Little Cost

Here, a Model 80 Superfinisher is in the process of making life easier and longer for camshafts-through finer, smoother, longer wearing bearing surfaces.

The camshaft is loaded into the

collet and supported with an airoperated tailstock. While the camshaft is rotating, the Superfinishing stones oscillate to scrub away the amorphous metal left by grinding. In 0.5 minute floor-to-floor time, this operation is complete.

These camshaft main bearings have a surface finish of 30-40 microinches before Superfinishing and 4-6 micro-inches after. The machine is quickly adjusted for other sizes.

The entire subject of Superfinishing is interestingly told in the book, "Wear and Surface Finish." Send for your free copy.

from bearing surfaces by Superfinishing.

Better camshaft performance is assured with smear metal, grinder flats removed



Close-up showing Superfinishing of 5 surfaces at once.

No. 7-852

Model 80 Camshaft Superfinisher.

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

Madison 10, Wisconsin

TURRET LATHES . AUTOMATIC LATHES . SUPERFINISHERS . BALANCERS . SPECIAL MACHINES

#### Vacuum Testing

(Continued from page 37)

test clean and dry for the next series of operations, which are done in a transfer machine; and no special preparation after testing is required.

It was found necessary to install two special Whittington combination chip collectors and filters in series in the vacuum line to the fixture. The chip collector bowl and filter have to be cleaned once per shift because of the loose chips in the casting from the mill operation.

The vacuum test machine is a complete unit with water jet type of vacuum producer installed in the base of the machine. The fact that there is only one moving part and no close clearances in the vacuum producer indicates that we may expert maximum vacuum production with very little maintenace for a number of years. The table of this machine is arranged with the panel and the fixture located on one end, so that another test station may be added if necessary. The single test station has proved adequate for the present production layout.

This is not our first experience with vacuum test equipment, as we have one test machine which has been in service about two years. It is being used to test sheet steel oil pans for automatic transmissions. This machine has seen heavy service and is still doing an excellent job.

#### Buick Extends Power Steering to Super

Power steering continues to grow in popularity, and Buick Div. of General Motors Corp. has extended the option to its Super line. Previously, it had been available only on the Roadmaster series.

#### Reduced Claims Assist Tucker Corp. Creditors

Creditors of the defunct Tucker Corp. may fare better than previously expected. Reduction of two Government claims is expected to leave more assets than previously estimated for recovery by creditors.

One tax claim of more than \$2.3 million was settled for \$245,000. Another Government claim for more than \$3.3 million in rent is expected to be reduced substantially.

(Advertisement)

#### AMBRICAN CHEMICAL PAINT COMPANY AMBLER TO PENNA.

### Technical Service Data Sheet Subject: PROTECTING ALUMINUM WITH ALODINE

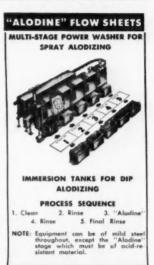
#### "ALODINE" No. 100

"Alodine" No. 100 forms an amorphous phosphate surface on aluminum which is thin, tough, durable, non-metallic, continuous with and a part of the basis metal. The "Alodine" film anchors paint, prolongs paint life, and protects aluminum exposed unpainted to the atmosphere.

With the "Alodine" No. 100 bath at its normal temperature of 120° F., coating time by immersion approximates 1½ minutes—and by spraying, 15 to 20 seconds. Coating times and bath temperatures can be varied to suit operating conditions.

#### "ALODINE" No. 600

"Alodine" No. 600 forms corrosionresistant coatings that provide excellent protection for unpainted aluminum and also make an effective paint-base. This grade is recommended for use in place of "Alodine" No. 100 on aluminum parts that are to remain unpainted or to be only partly painted; and on all aluminum castings and forgings whether or not these are given a paint finish.



"Alodine" No. 600 is applied at room temperature (70° to 120° F.). Recommended coating times are 3 to 5 minutes for an immersion process and 1 to 1½ minutes for a spray process.

COATING DATA	"ALODINE" NO. 100	"ALODINE" NO. 600		
COMPOSITION	Amorphous phasphoto,	Amerphous minture of metal actions and chrom- ates.  Depending on time of treatment, color range la from golden intérescent se lighé braven.		
COLOR	Depending on allay treated, color range is from an iridescent blue-green to a dark slate grey.			
THICKHESS	From 0.01 to 0.08 mil. No appreciable dimen- sional changes occur when aluminum is Alad- ized.	From 0.005 to 0.01 mil. He appreciable dime signal changes occur when aluminum is Ale ized.		
WEIGHT	50 to 300 mgs. per square feet. Optimum: 100 to 200 mgs. per square feet.	15 to 50 mgs. per square foot.		
SOLUBILITY	Insoluble in water, alcohol, solvenes, etc. In- soluble in meet dilute acide and alkalis. How- ever, strong acide and alkalis which ettach aluminum mby penetrate the "Aladina" (tim and react with the underlying metal. Slightly soluble in concentrated nitric acid. Soluble in meltan addism nitrate, etc.	Inscludio in alcahel, water, colimats, etc. Solubio in arrang albulls and oxide.		
PROPERTIES	High dialectrical resistence.	This coating is electrically conductive. Aluminum coated with "Aledine" He, 600 c be shielded-arc welded as apet welded.		
HEAT STABILITY	Unimpaired or temperatures that melt alumi- mats.	Unimpoised at temperatures that melt of		
PLEXIBILITY	Integral with and as flexible as the aluminum itself. Can withstand moderate draws.	Integral with and as flatible as the aluminu tracif. Can withstend medicate draws.		
ABRASION RESISTANCE	Approximately 90% of that provided by chronic acid anadized aluminum.	Approximately 99% of that provided by chromozid anodized aluminum.		
CORROSION	Pointed-superior to chromic acid anodizing. Unpainted-comporable with chromic acid anodizing. Meets MIL-C-5541 and other Government Finish Specifications.	Exceeds requirements of MIL-C-5541 and oven AN-QQ-A-676a (anedic films)		
PAINT- BONDING	Excellent, Equal to ar outerior to anadizing, Moots MtC-5541 and other Government Finish Specifications.	Excellent, Meets MIL-C-3541 and other Gar- arament Finish Specifications.		
TOXICITY	Mon-tenic.	Mon-tonic.		
BIMETALLIC CORROSION RESISTANCE	Shows good resistance against bimetallic or galvenic correcion.	Shows good resistance against bimetallis a galvanic corrector.		



WRITE FOR FURTHER INFORMATION ON "ALODINE" AND ON YOUR OWN ALUMINUM PROTECTION PROBLEMS.



#### **ASTM Golden Anniversary Meeting**

(Continued from page 51)

#### Effect of a Notch and of Hardness on the Rupture Strength of Discaloy

By F. C. Hull, E. K. Hann, and H. Scott

Westinghouse Electric Corp., Research Laboratories, East Pittsburgh, Pa.

In recent years much attention has been given to the development of heat-resistant alloys for use in the high-temperature, high-stress appli-

cations encountered in gas turbines and jet engines. Typical parts finding service in the temperature range 1000 to 1350 F include rotors, bolts, cou-

plings, fastenings, and sheet metal assemblies. The materials suitable for operation in this intermediate temperature range generally fall into two classes: those depending on the introduction of hot-cold work for increasing strength and those responsive to precipitation-hardening treatments. The writers have been concerned with alloys in the latter category, of which one type of alloy composition is considered here. An important distinction is that in the precipitation-hardening alloys every effort is made to obtain complete recrystallization on the solution treatment prior to aging, thus eliminating all work hardening with apparently enhanced reproducibility of properties and substantial reduction of directional effects. When hardening is accomplished by aging, there is less limitation on the maximum size of rotor that can be forged, due to restrictions based on capacity of the available forging hammers and presses for working alloys in the hot-cold work temperature range.

Turbine rotors and bolts are structural members in which particularly severe stress concentrations occur. In the former case the rotor periphery is slotted to provide interlocking projections to hold the replaceable rotating blades against the high centrifugal forces encountered. Bolt holes and other abrupt changes in section also introduce stress concentrations. In the case of bolts, the discontinuities at the heads and the sharp threads are stress raisers.

The design of engines and the selection of materials for use in certain elevated temperature applications are thus intimately related to the subject of notch sensitivity.

Our investigations of the effect of a notch and of hardness on the rupture strength of Discaloy have resulted in the following conclusions:

1. A standard test specimen should be adopted for notched bar rupture testing of heat-resistant alloys. It is recommended that this specimen have a 60 deg V-notch with a reduced section equal to one-half the full bar area and that the ratio of the radius of the curvature at the base of the notch to the full bar diameter be 0.020 in. The elastic stress concentration factor for these proportions is 3.9.

2. When fully recrystallized to the (Turn to page 90, please)



These heavy duty, self-propelled combines start their year's work in the grain fields of Texas . . . and follow the harvest north to Montana. That means months of day-in, day-out rough going . . . the kind that tests the strength and cooling characteristics of the radiator. Only the best will stand this type of heavy-duty performance . . and that's where Yates-American radiators fit into the picture to provide the double-duty cooling for both threshing and propelling. Specify Yates-American radia-

tors as standard equipment on your prod-

. . write today for full information

and descriptive literature.

California Representative: E. E. Richter & Son, Emeryville, Cal.





#### this "sleeve" gives valves a steady hand

For clock-like precision in up-and-down motion, valve tappets require smooth-as-glass guides—
"sleeves" tailored to 5/10,000 of an inch for snug, exact fit. For such precision work with a variety of products, leading manufacturers depend on Lycoming's production skill and resourcefulness.

Whether you require precision machining, high-volume production, product development—or air-cooled power for aircraft or ground applications—look to Lycoming! Long famous for aircraft engines, Lycoming offers extensive facilities and well-rounded experience.

To function precisely, an aircraft engine valve needs steady tappets. For a "guide" to steer tappets true,

Pratt & Whitney Aircraft called on Lycoming for precision production.



For a more complete story on Lycoming's varied activities and facilities, write—on your company letterhead—for the interestingly illustrated booklet "Let's Look at Lycoming."

AIR-COOLED ENGINES FOR AIRCRAFT AND INDUSTRIAL USES, . PRECISION-AND-VOLUME-MACHINE PARTS . GRAY-IRON CASTINGS . STEEL-PLATE FABRICATION

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FOR PRECISION PRODUCTION

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WILLIAMSPORT, PA. STRATFORD, CONN.



GENERAL ELECTRIC

PURCHASING VALUE ANALYSIS

FOUND THE RIGHT SUPPLIER

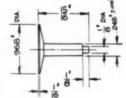
AND SAVED \$22,000 PER YEAR\*



General Electric engineers are constantly seeking new methods and cost-reducing short-cuts to present everincreasing values at lowest possible costs. This result is typical of their value-analysis work.

#### AMCAR COLD HEADS THIS PART

Meets All Specifications for Tolerances, Structure and Design; Saves Manufacturing Costs Totalling \$22,000 per Year.\*



You, too, may feel you have a part which can't be coldheaded — but ask a Camcar specialist before you say No! As Specialists in Cold-Headed Parts supply, their skill often far exceeds what is expected. Through combined metal-flow-technology and special tooling abilities, they offer an exclusive source for high volume supply on complex, highly specialized, metal parts.

\*\*General Bestric Figures.\*\*

When you need fasteners or special metal parts . . .
TELEPHONE 5-9451 or TELETYPE RK 8653

AMCAR SCREW & MFG. CO.

"PRODUCTION-DESIGNED FOR YOUR ASSEMBLY LINE"

#### **ASTM Meeting**

(Continued from page 88)

same grain size and aged to a stable hardness, the effects of hardener content on the creep-rupture strength and ductility of a precipitation hardened austenitic heat resistant alloy can be clearly shown.

- 3. Aged hardness increases regularly with content of the hardening agent, titanium, but correlated better with mechanical properties than does titanium content, presumably because standard analytical procedures do not appear to evaluate effective titanium content.
- 4. The creep-rupture strengths at 1000 and 1200 F increase to a maximum with increasing hardener content.
- 5. Creep ductility diminishes fairly consistently with increasing hardness to a value of about 3 per cent elongation and 4 per cent reduction of area at the strength maximum.
- 6. Rupture tests at 1200 F of notched specimens having an elastic stress concentration factor of 3.9 show a maximum in strength at a much lower hardness than for the plain bar specimens, ductility by plain bar test then being about 10 per cent elongation and 15 per cent reduction of area.
- 7. Notched bar strength falls at an increasing rate as hardness is increased above that at the maximum.
- 8. Notched bar strength is greater than plain bar strength at hardness values of less than 315 DPH associated with a creep-rupture ductility greater than 5 per cent elongation or 7 per cent reduction of area.
- Maximum notched bar strength is obtained with only a minor sacrifice in plain bar creep or rupture strength.
- 10. Exacting control of titanium content is necessary to obtain the optimum combination of plain and notched bar rupture strength.

(Turn to page 92, please)

Readers of AUTOMOTIVE INDUSTRIES are always WELL INFORMED Does He Knock or Boost Your Truck?



IT ALL DEPENDS
ON PERFORMANCE
and
PERFORMANCE
DEPENDS ON

CARBURETORS



What drivers and operators say about your vehicles has a mighty important bearing on the future of your business. So it is imperative that every component be selected on the basis of its contribution to lasting, satisfactory performance. In the field of heavy duty carburetion Zenith\* has long been recognized as the engineer's choice for quality performance under all operating conditions. You can be sure that manufacturers whose vehicles are Zenith equipped measure carburetor costs in lasting terms rather than initial expense. Zenith's rugged construction, strong idling freedom from stalling and obedient response to every power demand goes a long way toward building owner good will. That's why cost conscious operators and experienced drivers prefer Zenith equipped vehicles.

\*REG. U.S. PAT. 00F.

ZENITH CARBURETOR DIVISION OF

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(Continued from page 90)

#### Effects of Machining Specimens on the Results of Tension Tests of Annealed Alumium Alloys

By G. W. Stickley and K. O. Bogardus Aluminum Research Laboratories

The preparation of the specimens used in determining the mechanical properties of metals often involves some machining, grinding, or polishing operations. Such operations may produce cold work in the metal adjacent to the prepared surfaces, and the amount and extent of this cold

work depend upon the manner in which the operations are performed and upon the material. Generally the effect upon the evaluation of mechanical properties is insignificant and can be ignored but this is not necessarily true, particularly in metals having low yield strengths.

In various studies at the Aluminum Research Laboratories it has been observed that the machining of tension test specimens produced significant effects upon the results of tests of annealed pure aluminum. Accordingly, a study has been made to evaluate these effects, not only on pure aluminum but also on several wrought-aluminum alloys.

As a result of the studies, the following conclusions seem justified concerning the tension testing of annealed aluminum and aluminum allows:

1. The cold work introduced in the machining of test specimens, even when the machining is done in such a manner as to minimize cold working, has a significant effect upon the values of yield strength for materials having low yield strengths. The effect on tensile strength is insignificant.

2. The yield strength values for annealed 996A (99.6 per cent aluminum) with a yield strength of about 2500 psi are more than doubled by machining round specimens from rod in the usual way. The effect is less for materials having higher yield strengths but does not become an insignificant factor until a yield strength of about 10,000 psi is reached.

3. The effects of machining round specimens upon elongation values are not as clearly defined, although it appears that machining after annealing results in lower elongation values for materials having yield strengths lower than about 5000 psi.

4. The effects of machining upon the yield strength values of sheet specimens are of smaller magnitude and are insignificant for materials having yield strengths of about 8000 psi or more. There is no appreciable effect upon elongation.

5. Since there are not many specifications requiring the determination of yield strength values for annealed aluminum or aluminum alloys, machined specimens can generally be used for inspection tests.

 Cold work from machining should be minimized by using sharp tools and by taking light cuts when practical to do so.

7. Since reannealing of specimens after machining is not satisfactory, the only way of completely eliminating machining effects in the tension testing of annealed metals seems to be to use full-size specimens or, when this is impractical, to use specimens machined from a cold worked temper of the material (at least half-hard) before annealing.

(Turn to page 99, please)

#### **Built to Stand the Gaff**





#### Geared to Move Big Loads

Every part of this rugged ALLIS-CHALMERS tractor has strength to carry the toughest loads it's ever meant to move — and more — with a maximum margin of safety. Heavy-duty ROCKFORD CLUTCHES help it deliver more efficient, more productive work cycles. Let ROCKFORD engineers help you design dependable power transmission.

ROCKFORD CLUTCH DIVISION WARNING



GINEERING

WORK

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PRODUCTION

MAKES IT

ROCKFORD CLUTCHES

HYDRAULICS FOR MOBILE EQUIPMENT

### Mobile Equipment News

CUTS COSTS

### NEW VICKERS SERIES V-100 PUMPS ADDED TO MOBILE EQUIPMENT LINE

Compact, efficient, rugged . . . this new and smaller addition rounds out the Vickers line of vane type pumps designed especially for mobile equipment. These pumps have established a reputation for doing a better job and lasting longer . . . at lower overall cost.

#### HYDRAULIC BALANCE MEANS LONGER PUMP LIFE

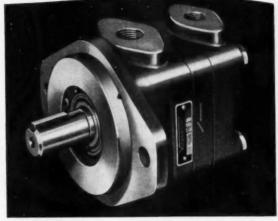
The two internal outlet ports are diametri-cally opposite each other. The same is true of the inlet ports. Thus equal and opposite thrust loads eliminate bearing loads due to pressure. Lighter bearing loads mean much longer bearing and pump life.

#### **AUTOMATIC WEAR COMPENSATION** MAINTAINS TOP PERFORMANCE THROUGHOUT PUMP LIFE

Radial compensation for wear is in the vanes. The vanes slide freely in the slots and are moved out into contact with the cam ring by centrifugal force then held there by hydraulic pressure as it builds up. As normal wear occurs, the vanes just move further out in the slots to compensate. (Wear is minimized because all parts are lubricated by the oil under pressure.)

Axial compensation is by means of a pressure plate held to correct running clearance by pressure from the system. It automatically moves in to compensate as wear occurs.

Automatic compensation eliminates need for "run ... efficiency is maximum the first time the pump is started. It also assures maximum delivery over a very long life, with none of the gradual falling off encountered where there is no wear compensation



#### V-100 PUMPS AVAILABLE GREATER MOUNTING IN 3 CAPACITIES

The Series V-100 Pump The Series V-100 Pump is available in three capacities: 1.5, 2.5, and 4 gpm at 1200 RPM and 0 outlet pressure. This choice of three capacities with same exterior dimensions facilitate metabolics. sions facilitates matching pump to the job.

Ask for Installation Drawing No. 152060.

#### ADAPTABILITY

Series V-100 Pumps are available in two mounting styles . . . flange (magneto type) and foot mounting. The pressure connection can be placed parallel, opposite to or at a right angle in either direction to the inlet by simply unbolting and rotating the pump head. Shaft drive is in either direction depending only on internal assembly.

#### **NO-LOAD STARTING**

At rest and normal starting speeds, the sliding vanes are retracted; only after engine fires do vanes expand and pumping begins.

### WICKERS Incorporated

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT

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### WHY THE DANLY CLUTCH AND BRAKE RUN COOLER The rotating parts in a Danly clutch and Brake subject to "pick-up" during clutch engagement are shown in color. Danly design reduces the weight of these parts to only 1/5 as much as those in a conventional clutch of comparable torque rating. The total energy to pick up all parts of the press subject to acceleration-including slide and diesduring clutch engagement is reduced approximately two-thirds. That's why the Danly Clutch and Brake run cooler and last longer.

A Danly 400 ton Single Action One Point Straight Side Press equipped with the Danly Cool-Running Clutch. Outboard mounting of both clutch and brake permit renewal of friction discs in less than 30 minutes.

### take a close look at the drive

Actual production tests show that the new Danly Cool-Running Clutch, an exclusive Danly Press feature, withstands up to 7 times more engagements than a conventional press clutch before it is necessary to make adjustment for lining wear. The resulting reduction in maintenance and press down time for clutch take-up, an important factor in press operating costs, accounts for outstanding savings.

Features like this—together with automatic lubrication and extra rigid precision construction—are the reason why time and cost conscious production men specify...

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Double Action Straight Side

CHART SHOWING EFFECT OF TEMPERATURE
ON RATE OF CLUTCH WEAR.

ZONE OF DISINTEGRATION



MECHANICAL PRESSES ... 50 TO 3000 TONS

HYDRAULIC METALWORKING EQUIPMENT

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Chart shows how heat causes disintegration of lining in a press clutch. The steep slope in the curve shows how wear rapidly increases with temperatures.

The cool running Danly clutch generates less heat and the small amount generated is rapidly carried off by a continuous blast of forced air.

Normal operation of a Danly Cool Running Clutch is only 35° above room temperature!



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A number of Lord Vibration-Control Mountings are available with silicone elastomers, and new designs are being engineered to take full advantage of the properties of this new material.

You can solve many product problems with Lord bonded-silicone parts which are used to isolate vibration and reduce operating noise, and protect parts from excessive stresses.

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### 16th Annual Time and Motion Study and Management Clinic, Indus-trial Management Society, Sheraton Hotel, Chicago, Ill.. Nov. 5-7

#### Third Annual International Motorama, Los Angeles, Calif. .. Nov. 7-16

### 

#### 1953

National	Tra	nsport	Ve	hicle	Show	
and	Fleet	Maint	enai	nce ]	Expost-	
tion.	New	York.	N.	Y	Feb.	24-21

#### American Society for Testing Materials, Spring Meeting, Detroit, Mich. ......Mar. 2-6

#### National Association of Corresion Engineers Ninth Annual Conference and Exhibition, Hotel Sherman, Chicago, Ill.........Mar. 16-20

#### German Vehicle Show, Frankfort, Germany ......Mar. 19-29

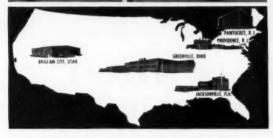
### 

#### American Society for Testing Mate-rials, Chalfonte-Haddon Hall, Atlantic City, N. J....June 29-July 3

### Eighth National Instrument Confer-ence and Exhibit, Chicago, Ill., Sept. 21-25

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Within the finest research and development laboratories in the automotive filter field, alert Fram scientists and technicians constantly develop and perfect Fram products. After exhaustive performance tests in the laboratory, new Fram products and new developments of existing products are given intensive workouts on the Fram test fleet and in the famous Fram Dust Tunnel at Dexter, Michigan.

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Complete engine protection from the outside and from within the engine itself is vitally important to continued top performance. Fram Oil, Air, Fuel and Water Filters and Crankcase Ventilators lengthen the life of engines, decrease maintenance, cut repair bills and increase mileage between overhauls . . . saving motorists time, trouble and money.

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(Continued from page 92)

#### An Inquiry Into the Reproducibility of Impact Test Results

By H. L. Fry, Foreman, Special Tests,

Steel manufacturers in certain fields are being faced by a gradually increasing demand for materials that vill meet specific minimum requirements on an impact test. Some specification writers and engineers seem to feel that the Charpy or the Izod test can be used as a suitable test for specifying steel. Articles have appeared recently in the literature purporting to provide a way to use an impact test in an exact and quantitative manner to specify steel of the proper toughness to withstand shock loading. A four-year study of the impact test at Bethlehem Steel Co. has convinced us that this tendency places an entirely unwarranted confidence in the reliability of the impact test.

If a test is to be used for specifying material it is of fundamental importance that any two laboratories performing the test under suitably controlled conditions should be able to agree within reasonable limits as to the results of testing a particular material. This is far from true of the impact test.

One impact testing machine may be able to reproduce its own results with a satisfactory degree of precision, but differ widely from the equally reproducible results obtained on another machine. This can occur even though material and test conditions are the same and even though both machines are "accurate" as determined by available means of calibration. To make matters worse these same two machines may be found to agree with each other or to have reversed their relative positions when testing another material, or even the same material at a different temperature.

There is no such thing as a standard to which results on various machines may be referred and apparently no possibility of establishing such a standard.

Our study, on which the foregoing conclusion is based, has consisted mainly of performing a large number of comparative tests on various materials on five impact machines, with all variables controlled as closely as possible (see Fig. 1 on first page of this article). Most of the work was done on keyhole-notch Charpy specimens, but Izod and V-notch Charpy specimens also were studied. Through the cooperation of other groups, additional comparative tests have been made on several other machines.

Attempts have been made at Bethlehem to determine what feature of the design or behavior of the testing machines may be responsible for the wide divergence found among machines. In particular the high speed motion picture camera has been used

to observe the machine and specimen hehavior

The impact test, as now used, is certainly not suitable for an accentance test. Our testing conditions were at least as rigidly controlled as they could possibly be in routine acceptance testing. Therefore, in such routine testing it must be expected that different laboratories will produce results as widely divergent as any we have shown here. Such tests will therefore fail to show whether or not the material tested actually meets the standard that has been set up for acceptance.

(Turn to page 102, please)

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for Salt Fog Tests Meets the latest specifications of government and military authorities.

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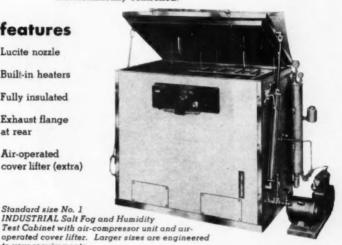
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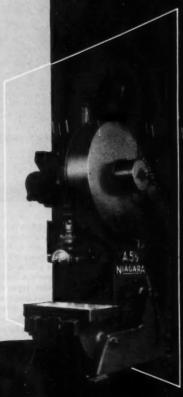


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### Electrically Controlled Air Actuated SLEEVE CLUTCH

# PROVIDES ECONOMY AND EFFICIENCY OF OPERATION for presses with high frequency clutch engagement

- ASSURES POSITIVE DRIVE, no slippage.
- HAS NO FRICTION SURFACES to heat up or wear.
- IS SMALL IN DIAMETER and therefore has low inertia, thus minimizing power lost in starting and stopping.
- RUNS IN A BATH OF OIL to reduce wear.
- HAS LOW AIR CONSUMPTION which reduces operating costs.
- LOCATED AT END OF SHAFT so that it can be quickly and easily disassembled for inspection and servicing without removing clutch gear.
- HAS FEW MOVING PARTS...integral jaws and splines resulting in reduced maintenance costs.
- HAS SINGLE SOLENOID VALVE to control air flow to both clutch and brake, preventing overlap of clutch and brake action, a distinct possibility when separate solenoid valves are used.
- PROVIDES EFFORTLESS OPERATION with palm button or foot switch.
- PROVIDES INSTANT ENGAGEMENT OR DISENGAGEMENT at any point in the stroke.
- CAN BE SINGLE STROKED, JOGGED or operated continuously.
- CAN BE STOPPED INSTANTLY by stop button, electric eye, limit switch or similar device.
- STOPS AUTOMATICALLY if electric current or air pressure fails, an important safety feature.



(Continued from page 99)

There appears to be no way of applying a correction factor to compensate for the discrepancies or of establishing a standard machine. If some machine were selected as standard one could not be sure whether any other machine would give higher or lower values than the standard on any particular test. Furthermore, if ever the standard machine required repair, adjustment, or replacement of a part there would be no certainty that it would perform the same as before.

We have consulted various impact testing machine manufacturers and the National Bureau of Standards in regard to this problem and have not received any concrete suggestions as to a solution. The Bureau of Standards is willing to undertake an investigation and an attempt at standardization of the impact test only under the sponsorship and at the expense of an industry group such as the ASTM.

#### **Testing Fuels and Lubricants**

(Continued from page 50)

transmissions for checking transmis-

Fundamentally, all performance de-

terminations carried out in the engine testing laboratory involve the same basic techniques, namely, operation of engine (or equipment) under given conditions, for a given period, with the fuel or lubricant under test, and ascertaining precisely the change in the condition of the engine or the product resulting from the test. Thus. before a test run, the engine to be used is thoroughly cleaned, and the bearings, piston rings, valves and similar parts are accurately weighed and measured. Subsequent to the test run, the engine parts are again precisely weighed and measured to determine the amount of wear and other changes that have occurred. Engine parts are maintained under constant temperature for 24 hours prior to any weighing or dimensional measurements.

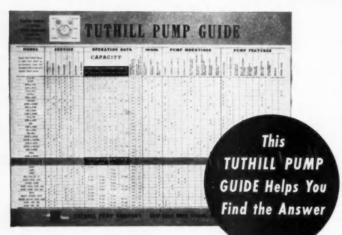
Typical tests are conducted with the operator observing and logging such test data as: engine speed; brake horsepower; fuel consumption; water flow rate through engine jacket; oil and water temperature in and out of engine; intake air temperature; exhaust temperature and fuel input temperature. Other data that are logged include: oil pressure; intake manifold pressure; exhaust back pressure, and air-to-fuel ratio.

In the engine test stand, Chevrolet engines are employed as the standard multi-cylinder test engine, and Caterpillar engines serve as the standard single cylinder test engines. All test engines are individually loaded with a-c operated dynamic brakes of the eddy current type. Heat is removed from the brakes by circulated cooling water. Hydraulically operated throttles are employed, for the most part, to permit remote control of engine acceleration from the adjacent control room.

Tachometers, electrically wired to dial type indicators on the test stand control panel, show engine speed. Required test temperatures are indicated on push-button type Brown Electronik precision indicators, one of which is located at each engine test position.

(Turn to page 105, please)

### NEW EASY WAY TO SELECT THE RIGHT PUMP FOR THE JOB



To save you time and trouble in selecting the pump best suited to your application, Tuthill engineers have developed this revolutionary new

Pump Guide. Here, in one easy-to-use chart, is a volume-full of information on the complete line of Tuthill Pumps.

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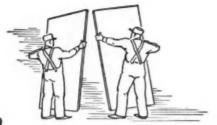


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### Have you a similar fastening problem?

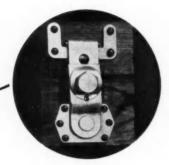
How a strong structure can be designed for speedy and simple assembly with unskilled labor, no special tools...



The U. S. Air Force wanted a jet-aircraft hangar design that would be portable by air, yet strong; would assemble quickly; be interchangeable, and flexible enough for easy structure modification.

The answer lay in a panel structure using modular units. Armorphy honeycomb panels faced with thin aluminum, developed by United States Plywood Corporation, provide lightness, strength, flexibility. Joining one panel to the other in the field with untrained help was a problem until Simmons Fastener developed LINK-LOCK, a simple latching device that operates with minimum wrench pressure on hex nut.

This fastening problem is being successfully met by combining the design ingenuity of No. 1 LINK-LOCK with the proved performance of honeycomb plywood panels.



No. 1 LINK-LOCK—like No. 2 LINK-LOCK—features simplicity, positive action, high strength.

No springs are used in No. 1 LINK-LOCK. Locking action is obtained by rotating a nut that moves a sliding latch in and out of position. Up to 1500-lb. pull-down pressure is available; the device carries up to 4000-lb. tension. No. 1 LINK-LOCKS provide for surface mounting, simplifying installation.

Where can you use it? When you need heavy fastening pressures, resistance to impact, operation in 70-below temperatures—and where ease of action, compactness, and low cost are important factors. Write for a No. 1 LINK-LOCK Data Sheet.

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LINK-LOCK
QUICK-LOCK
SPRING-LOCK

FASTENERS THAT IMPROVE PRODUCTS AND REDUCE ASSEMBLY COSTS

#### **Testing Fuels and Lubricants**

(Continued from page 102)

To facilitate temperature logging for the operators, push-button positions on all instruments are standardized insofar as feasible. Thus, the first push-button on each Electronik precision indicator connects the thermocouple in the input water line to the jacket of the associated engine. In this way, the temperature of the water from the cooling tower is indicated as it enters the engine under test. In similar fashion, push-button locations are standardized for indicating temperatures of output water from jacket, oil sump, oil gallery, intake air, fuel input, and the like.

The master control panel incorporates four multi-point Brown Electronik recorders, and one single-record high-speed Electronik recorder. By means of a unique plug and jack switching arrangement, the recorders can be connected so as to put any desired test temperature under continuous observation. A combination of 1200 temperature points can be switched by the plug and jack arrangement.

Likewise, the multi-record instruments can be switched to provide records of several temperatures on a single chart, each identifiable by a characteristic symbol (i.e. print mark). Chart records of critical temperatures obtained in this manner serve as a monitoring check on test temperatures, and also provide confirmation relative to any questions that might possibly arise subsequent to the conclusion of a test run.

Iron-constantan thermocouples are used for all temperature points throughout the dynamometer laboratory. No copper is used either in the thermocouple or the switching circuit external to the instrument itself. All plugs and jacks are iron to iron and constantan to constantan contacts.

Further protection against possible inaccuracies in temperature measurement is obtained by locating the recorders centrally in the manner described.

The gear test stand essentially comprises an induction-type drive motor, necessary coupling shafts and gearing, and an a-c operated dynamic brake. Capable of handling practically any automobile rear end, the gear test stand greatly facilitates checking the performance of extreme pressure differential lubricants.

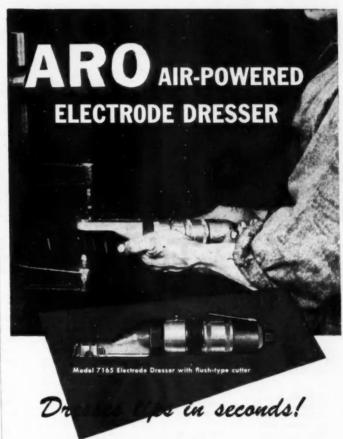
Design of the test stand drive and

braking equipment is such that a wide variety of operating conditions can readily be simulated. In any event, the test procedure is basically the same, namely, operating the grease for a given period under known test conditions and evaluating the change in condition of parts such as gears, resulting from the test, such

as galling of the gears, bearing wear, etc.

Instrumentation for the gear test stand includes temperature measuring equipment and an arrangement for directly indicating torque. An Electronik strip chart potentiometer provides a permanent record of the vapor and oil temperatures in the differential under test. A push-button precision indicator gives indications of various temperatures such as that of the absorber, spill box, etc.

(Turn to page 107, please)



- \* Improves quality of weld
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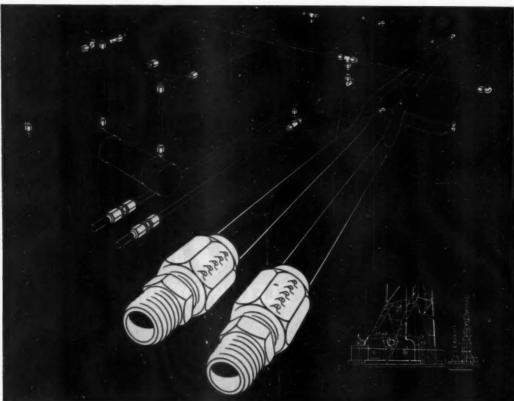


Illustration based on Unit Rig oil filter system. Courtery Unit Rig & Equipment Co.

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#### WITH ALUMINUM TRIPLE-LOK FITTINGS

This does it

Triple-lok . . . 3-plece flare fitting famous for its sleeve . . . the easiest way to install tubing systems. Made in brass, steel, stainless steel, aluminum alloy.

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In the oil fields, for example, where equipment is out in the open, subject to all kinds of atmospheric conditions. Here you'll find precision-made, corrosion-resistant, leakproof PARKER ALUMINUM Triple-lok Fittings on many types of equipment. Such as the versatile Unit Rig draw works . . . with ALUMINUM Triple-lok on oil filter, oil pump, and air supply lines.

PARKER ALUMINUM Triple-lok Fittings are designed and precision made to be leakproof under even the severest conditions of vibration—elevated temperatures—high pressures—and repeated reassembly . . . and to hold leakproof beyond tube bursting pressures. That's why you'll find them on oil field equipment . . . on control lines for delicate instrumentation . . . wherever failure-proof tubing systems are demanded.

So tube it up and forget it . . . with PARKER Triple-lok Fittings. Distributors listed alongside now have stocks of ALUMINUM Triple-lok Fittings in the popular, medium sizes.

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#### **Testing Fuels and Lubricants**

(Continued from page 105)

The indicating potentiometer in the center of the instrument panel is a Brown Electronik instrument, specially modified for use with Baldwin strain gage units. Operating in conjunction with a Baldwin torque unit, mechanically connected between the test stand motor drive shaft and the torque tube of the rear end under test, the instrument provides a constant evaluation of torque, indicated directly in foot pounds.

Essentially comprising bonded

strain gages arranged around the circumference of the torque unit shaft, electrically connected to form a bridge circuit, and equipped with slip rings for providing an electrical circuit to the instrument, the unit operates from power obtained from the indicating instrument. Design of the circuit is such that three ranges are provided. These can be selected by turning a knob on the front of the instrument. Ranges provided are 0 to 1, 1 to 2, and 0 to 2 if ft.

#### **AIRBRIEFS**

(Continued from page 72)

couldn't even have a deHavilland Comet in service before 1956—so that America is thoroughly stymied all the way around in the jet transport field.

#### Logjam Breakup

But the logjam in the U. S. jet transport field may be broken by the time you read this. Douglas is ready to announce its DC-8 jet transport powered by four Pratt & Whitney J57 turbojet engines of 10,000 lb thrust each (the type used in the Boeing B-52 and Convair YB-60 bombers). The DC-8 will carry 56 passengers in a luxury version or 80 passengers coach-style at a speed of 585 mph. The craft will weigh 146,500 lb and cost about \$4 million each. It has long been known that Boeing, Douglas and Lockheed are well advanced on the design of jet transports but none have yet announced a firm design ready for construction nor have any airlines come forward with firm orders for any of them. Pan American, always the leader in introducing new aircraft types, is favored to be the first U. S. airline to order a jet transport and the spark that explodes the revolution in U.S. transport may well be announcement of a Pan American order for the Douglas DC-8. It is certain that such an order will be followed quickly by Trans World Airlines. The situation has built to a boiling point and the whistle may blow on the race at any moment.

#### **Titanium Start**

After a vigorous promotion campaign over the past five years, titanium, "the wonder metal," is about to get its start in aircraft structures.

Douglas has revealed that the engine nacelles of its new DC-7 transport will contain about 88 per cent titanium and result in a weight saving of about 200 lb, or one passenger per airplane. The metal will be used in a 0.025 in. gage in the engine nacelles, replacing the aluminum alloy and stainless steel presently used in the DC-6B nacelle. Douglas will also use titanium in the DC-7 landing gear doors. This is a far cry from the widely-heralded "titanium airplane" predicted as long as two years ago but it is, nevertheless, a start along the road. The delay in application of titanium to aircraft structures, in addition to the obvious problems of supply of the raw material at low cost, has been occasioned by the necessity for a very complete fabrication research program by individual companies. It has been found that titanium is very difficult to work with unless certain precautions are followed and it appears that prior to its application to a particular part a substantial fabricating research investigation must be made to determine just how the metal behaves in the jigs and dies used for the particular part. The Douglas DC-7 engine nacelle application will provide an important test of the new metal in actual service under vibration and stress conditions in all kinds of weather. However, none fear for the future of titanium in aircraft construction-it's only a matter of long development work.

#### **Plant Solution**

In these days of on-again off-again war production expansion and air-

Notand Company
11 Salem Ave. (10)
Rockford Tool & Transmission Co.

Rockford Tool & Ironsmission — 820 Broadway General Machinery & Sup. Co. 1346 Folsom St. (3) Eagle Metals Co. 4735 First Ave., South (4) Metal Goods Corp. 5239 Brown Ave. (15) Whitehead Metal Products Co. 207 West Torylor St. (4) Williams & Co.

Williams & Co. 650 E. Woodruff Ave. (2) Metal Goods Corp. 302 North Boston (3)

Railway & Power Engineering

Mercator Corp. 438 Walnut St. Reading, Pa.



#### **AIRBRIEFS**

(Continued from page 107)

craft production stretch-out problems. the only practical solution seems to be an elastic plant, which can expand and contract its military production with each shift of the Congressional wind. Well, General Motors is building just such a plant at Arlington, Texas. The big plant, with a total space of 1,250,000 sq ft, is being arranged on the basis of 1/3 of that space for combat aircraft fabrication and assembly and % of that space for Buick-Oldsmobile-Pontiac assembly. The plant will be used for the assembly of the Grumman Navy jet fighter in addition to GM passenger cars. Interior arrangement will be flexible. On the basis of % utilization of the space, the plant can assemble 20 automobiles per hour. In the event of cancellation of the airplane contract, the entire plant can be quickly converted and automobile assembly stepped up to 35 per hour. Likewise, aircraft assembly can be increased several times in emergency by cutting into the car assembly space. GM is solving this accordion problem by placing the more bulky automobile processing equipment, such as spray booths, bonderizing and heating ovens on the upper floor of the plant out of the way of main floor assembly operations. Conveyor lines for automobile assembly are carried in channel pits below floor level so that they may be quickly covered over. GM is following this same dual-role principle in its new Willow Springs, Ill., plant, where it will manufacture Wright J65 Sapphire turbojet engines alongside automobile body stamping operations,

#### Still at Work

It may surprise you to know that the Navy has just accepted delivery on a brand new blimp, the Goodyear ZPN-1, largest non-rigid airship ever built. It sounds strange in this age of jet transports and supersonic fighters to hear of Navy blimp construction, but for the tedious job of tracking down an enemy submarine exposing only a thin snorkel tube in several thouands of miles of ocean. the heavily-electronic equipped blimp is still the best snorkel-snooper instrument available due to its ability to hover or move slowly while trailing listening equipment and to remain at the job for several days and nights.

# For Better Hydraulic Brake Cylinders



Permanent Mold Gray Iron Castings



Send for your copy of the illustrated booklet, "A Picture Tour of the Eaton Permanent Mold Foundry." Free machinability
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#### The BUSINESS PULSE

(Continued from page 70)

ago. The nonfarm total was about half a million higher, but this was approximately offset by an equivalent decline in farm jobs. Unemployed members of the labor force totaled 1.6 million, about the same as in the preceding month and a year ago. This is equal to about 2½ per cent of the labor force, close to the practical minimum.

Construction activity, given impetus by public outlays for military, defense-plant, and atomic-energy facilities, continues close to record levels. Expenditures of \$2.7 billion for all types of construction activity in May raised the total for the first five months of the year to \$11.9 billion, about half a billion more than in the like period of 1951. A sharp

rise of 25 per cent in public projects so far this year has more than offest a decline of some four per cent in the value of private construction.

Congress, which has spent a great deal of time in considering possible action in the steel dispute and in debate on the renewal of the Defense Production Act, has not yet completed any of the major appropriation bills for fiscal 1953. While substantial amounts have been cut in committee from the \$85.4-billion total which the President has requested, it is by no means certain that the sum finally voted will fall appreciably short of what the Administration wants. Not only have officials been urging Congressmen to restore the cuts which have been made in committee, but, in addition, the President has already submitted a supplemental request for the Defense Department totaling \$3.5 hillion

#### Treasury Raising "New Money"

Thus, with authorized spending very likely to exceed tax receipts by upwards of \$10 billion during the year ahead, the Treasury has begun to raise "new money." Having suffered one of the worst rebuffs ever encountered in its history late in May when it offered a long-term nonmarketable bond to nonbank investors, the Treasury opened its books on May 16 for subscriptions to a six-year, 2% per cent marketable issue. Subscriptions were taken from banks as well as nonbank sources, thus making the offering the first "bank issue" since the early days of the Second World War.

The decision to revert to this sort of financing, with all its inflationary implications, drew immediate criticism from market experts who had recommended that the Treasury follow the noninflationary course of tapping private savings by the issue of a long-term marketable bond bearing interest of at least three per cent. The fact that the Treasury employed a "bank issue" instead confirmed their long-held suspicion that it was unwilling to pay the cost of borrowing these savings.

The new issue, which appeared to be deliberately underpriced to assure its success, was oversubscribed three times. Subscriptions totaling \$3.6 billion from nonbank sources were allotted in full, while subscriptions by banks were allotted on a percentage basis. While commercial banks re-

(Turn to page 114, please)





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#### ALCOA FOIL

Do using small arms used to be a mean chore. Now, a pludy developed pouch pure this "45" in the soldier's hands ...../end-

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Alco, it in outeriers the nation's leading packaging to serve costs. It developing new trays to package many probable better, in for all out laminates. For all information on positions and a liabilities, just call plur lead Alcon selection under "Alumina" in your classified phone of the probabilities.

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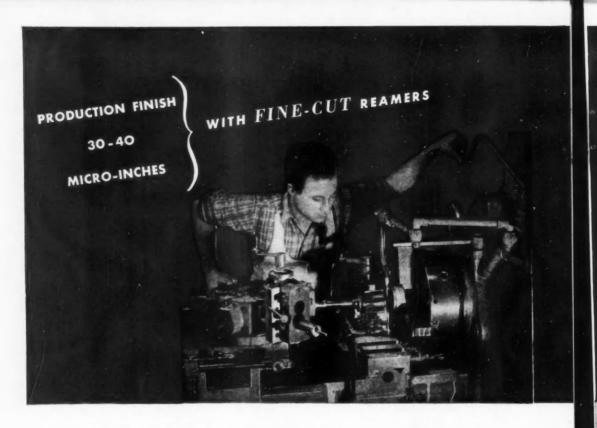


ALCOA TELEVISION - COS Michaels, 6:30 to 7:00 P. M. (DST every Sunday on most stations - 1:30 to 0:50 P. M. in for Most



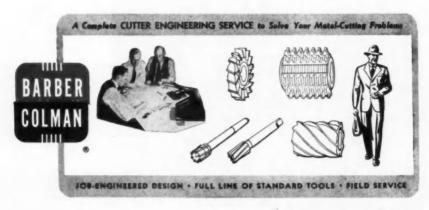
Principal region region (in Debethroom Marshard by Estings Consider Div., United States Earthur Co.





You can ream finishes like this in regular production operations with Barber-Colman Fine-Cut Reamers. Many jobs which previously required finishing by lapping or honing are now being finish reamed with these Fine-Cut reamers. All elements for fine finish, accuracy and tool life are provided in the reamer design and application of Barber-Colman job-engineered reamer sharpening.

With assurance of this built-in control, more pieces can be finish-reamed before breaking the set-up for re-sharpening. In addition, the Barber-Colman blade mounting design combines outstanding tool life with ease of blade adjustment and absolute rigidity. That's why you outproduce—and outearn—conventional tool designs every time with Barber-Colman reamers.



## Barber-Colman

#### FINE-CUT REAMERS

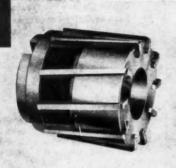
## ONE-CUT FINISH REAM 30-40 MICRO-INCH FINISH, CUTTING 170 FEET PER MINUTE, USING .008" - .010" FEED

No special tooling is required to get results like these. A standard turret-lathe set-up is used. The large number of blades in the reamers provides extra stability in the cut and smaller chip load per tooth, resulting in a very fine finish.

Front chamfer, secondary lead and back taper are specified for these particular job conditions by Barber-Colman Reamer Engineers to produce free-cutting and easy chip removal without scratching, back scoring or gouging.

If you are now choosing between accurate, quality-finish reamed holes—and low-cost production and reamer maintenance—you can have both, using Barber-Colman adjustable reamers. More blades per cutting diameter—blades solidly held in cutting position—Barber-Colman standard irregular blade spacing—these features produce tool room quality under production reaming conditions.

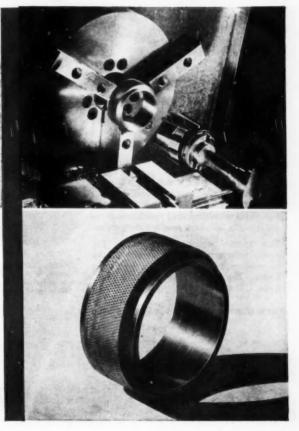
Send specifications on hole sizing and finishing problems to Barber-Colman engineers. They will furnish reamers to give you the desired quality consistently.



- 1. Reamer, held in turnet lathe float, is fed to work revolving at 170 feet per minute, using .008"..010" feed. Three thousandths stock is removed in a cut 2.88" diameter and 1-1/2" long.
- 2. Irregular spacing of ten reamer blades is arranged so that diameter size is easily checked across any two blades. Wedge mounting at bottom of blades permits more blades per reamer diameter — hence, finer finish.
- Consistent 30-40 micro-inch finish is obtained on these precision boring head collars throughout the life of the reamer because of Barber-Colman job-engineered reamer sharpening.

#### Barber-Colman Company

GENERAL OFFICES AND PLANT, 827 BOCK STREET, ROCKFORD, ILLINOIS, U.S.A.



#### **Business Pulse**

(Continued from page 110)

ceived only some \$507 million initially, it is expected that they will eventually purchase most of the total allotted to nonbank subscribers, many of whom are thought to have been "free riders," that is, speculative purchasers who saw a chance-since the bonds were underpriced-to make a profit by quick purchase and sale and who had no intention of holding the bonds as investments. If, as is expected, the commercial banks ultimately absorb most of the offering, it will be necessary for them to raise reserve funds of upwards of a half billion dollars. To the extent that they ing in further deficit financing.

are able to do this, an expansion of bank money will result, providing the basis for a renewal of upward price tendencies. The hope has been expressed that Treasury officials will heed this danger and overhaul their techniques accordingly before engag-



Successful operation in many thousand motor-driven products and devices—over a period of 36 years—has proved the thorough reliability of Lamb Electric Motors.

The good service for which Lamb Electric Motors are known, results largely from the fact that they are designed to provide the exact electrical and mechanical requirements for each product they drive.

This special engineering assures top product performance and usually results in savings in space, weight and cost factor. The Lamb Electric Company, Kent, Ohio.

THEY'RE GOING INTO AMERICA'S FINEST PRODUCTS

Motor having substantial power output for computing machines and other types of motor-driven office equipment,



Planetary inbuilt speed reducer permits a straight-line drive, symmetrical construction; insures good performance.

Lamb Electric FRACTIONAL HORSEPOWER

#### Volkswagen May Build Plant in Canada, Perhaps in U.S.

During the course of a recent visit to the U.S., Heinrich Nordhoff, director general of the German Volkswagen Co,. stated that he planned to investigate the possibility of building an automobile plant in Canada.

When queried as to why he does not envisage the U.S. as a site for such a plant in this part of the world, he expressed his belief that the small Volkswagen export model, which is said to represent 80 per cent of the company's production, is better suited to Canadian than to American use. However, if the Canadian project goes through, and U. S. sales increase simultaneously, the firm will consider further the establishment of a U.S. factory, he said.

Overall Volkswagen production is reportedly running about 525 cars a day. Imports into the U.S., which started two years ago, are said to run 150 vehicles per month. It is expected that this figure will be upped as sales and service facilities are increased.

#### **Engine Output Prospects** Seen as Quite Favorable

Control officials stated recently that reports from manufacturers of internal combusion engines indicate that sales and production for the fourth quarter are bright, if they can get the steel

Like the automobile industry, engine manufacturers want all controls on materials lifted at the same time. not one at a time. The exception is inventory controls, which the engine makers would like to see lifted at

#### **Turbine Engine**

(Continued from page 39)

gentially through eight separate diffuser passages. Each passage leads to an elbow which now has cascade vanes. The vanes give a smooth and uniform airflow which equalizes combustion chamber temperatures and promotes longer life.

Combustion chambers are of conventional design with a flame tube inside an outer casing, and a centrally placed burner at the upstream end of the chamber. The reduced length of the 700 Series compressor has enabled a corresponding reduction in length and weight of the combustion system to be made.

## Bendix STARTER DRIVE PERFORMANCE **PROVEN**

**INSTALLATIONS!** 

Few products have ever won the overwhelming approval accorded the Bendix\* Starter Drive. In automotive vehicles of all types, in the marine field, in stationary engines and aircraft, in fact wherever motors start, more than eighty-five million Bendix Drives have established an unrivaled record for dependable performance. Perhaps even more remarkable is the fact that in most installations manufacturers have paid less for the Bendix Drive than for other types. This unique combination of dependable performance and low cost is made possible by Bendix exclusive design features. For example, the Bendix Starter Drive requires no actuating linkage and the solenoid may be placed in any convenient position. Result-starting motor can be mounted more easily and in more positions. Also the Bendix Drive has fewer parts and needs no adjustments. If you want true economy, plus performance proven by over 85,000,000 installations, be sure to specify Bendix Starter Drives. Your inquiry will receive immediate attention.

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**SPECIALISTS** IN ALL TYPES OF STARTING!









ACCELERATOR



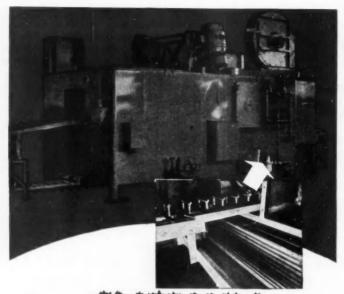
CLUTCH PEDAL



FLOOR BUTTON



SWITCH KEY



## use of **PLATECOILS** gives CENTRI-SPRAY WASHING MACHINES construction and sales advantages

In building several of these motor block washers for a large automobile manufacturer, Centri-Spray, Inc., Detroit, Michigan has found that the use of Platecoils has 6 important advantages.

- I Higher heat input per cubic foot for quicker heat-up.
- 2 Easier Installation with Platecoil banks.
- 3 At least 90% of threaded pipe joints eliminated to reduce leakage problems.
- 4 Longer service without cleaning.
- 5 Less condensate trapping in Platecoil bank as compared with serpentine pipe coil.
- 6 No wire cutting in return bends through much lower steam and condensate velocity.

A bank of three  $18 \times 83$  Platecoils is used instead of a pipe coil consisting of 42 pieces of one inch pipe  $85^{\prime\prime}$  long, and two pieces  $87^{\prime\prime}$  long. In addition 44 return bends were needed plus the straps and separate tie bars required. Use of the Platecoils not only simplifies fabrication for Centri-Spray, but it also gives their customer a more efficient, dependable washer.



#### Electroformed Nickel

(Continued from page 36)

used, since this bath provides a deposit of moderate tensile strength and good ductility.

Among the numerous applications which Super-Matrix Co. has produced in electroformed nickel are:

(1) De-icer rings with aerodynamic airfoil cross-sections with attaching arms, all in one piece. This part being made in nickel eliminates all possibility of corrosion from de-icing fluid which might cause plugging of tiny spray holes in the de-icer ring.

(2) Thin walled tubing in long lengths with accurate inside and outside diameters, and wall thicknesses in the range of 0.005 in. to 0.20 in., particularly for high temperature and high pressure work. Due to the good tensile strength of electroformed nickel at elevated tempera-

TABLE 1-BATHS FOR ELECTROFORMING

Material	Watts Bath (Low pH)	All Chloride Bath	Hard Nickel Bath
Single Nickel Sulfate ox/gal. Nickel Chloride oz/gal.	40-44 4-6	40	24
Ammonium Chloride az/gal. Boric Acid oz/gal. Temp. Range °F. pH Current Density A.S.F.	4-5.5 120-140 1.5-4.5 25-100	4.0 130-150 2-3 25-100	3.3 4.0 110-140 5.6-5.9 25-80

TABLE II-AVERAGE MECHANICAL PROPERTIES OF NICKEL DEPOSITS

	Watts Bath	All Chloride Bath	Hard Nicke Bath
Teneile Strength p. s.l. Elengation in 2° Hardness (Vickers) Special Properties	51,000 30% 150 Seft	28,000 21% 245 Best throwing power simple control mum rough- ness.	150,000 8% 425 Very hard deposit best for wearing properties.

tures a weight saving of as much as 30 per cent is effected over fabricated stainless steel duct work.

(3) Female forming dies with shapes of such a nature that manufacture by machining or casting is extremely difficult or expensive. Such dies are used in manufacturing aircraft parts by low pressure laminating of resin-impregnated glass fabrics.

(4) Hot air ducts of varied shapes and types which have to operate at temperatures of up to 1000 F, and pressures up to 125 psi.

(5) Specially shaped airfoil sections for test purposes.

From Nickel Topics

#### EQUIPMENT UNITS THAT BESPEAK QUALITY

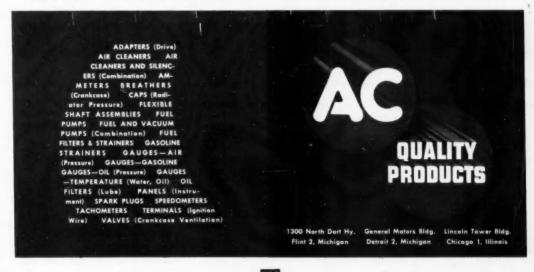


America's busy highways and quiet country lanes are the proving grounds for AC's equipment units. There, under every condition of road or load, the finished products of over 300 manufacturers are proving 22 kinds of AC equipment.

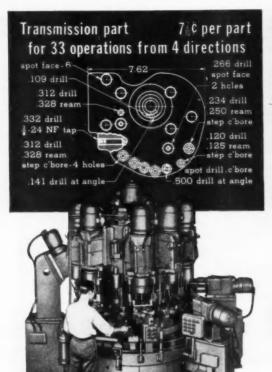
Every year, new customers are added to AC's im-

pressive list. That's convincing evidence of AC's ability to pass the greatest test of all - the constant grind of year-round service.

Is your problem performance? Serviceability? Long life? AC engineers will work with yours to apply any of their 22 products to your specific needs.







for 27 operations from 5 directions 113 drill & c'sink no. 6-40 NF tap 3 holes 90° apart .094 drill & c'sink 3.62 no. 4-48 NF tap 9 holes 104 drill & c'sink no. 5-44 NF tap 375 ream 970 PARTS AN HOUR GROSS. Twelve fixtures on a 20-inch

c per part

Telephone part

185 PARTS AN HOUR GROSS. This 60-inch power indexing machine has 12 stations. Eight vertical units mounted on the central column operate 28 tools. Two angular units drill .141 and .500. Two horizontal units drill .109 and .332 and tap 3/4-24.

power index table rotate 120° with each index. Four horizontal units drill and tap the peripheral holes. Three vertical units do the ten axial holes. Clamping and unclamping are automatic.

#### Any way you figure it, Kingsbury machines save money on You can use actual figures accurate high-production drilling and tapping operations

Dear Sir:

Here is the average cost of the man national average; and machine for each operation shown in the drawings:

Transmission part 22/100¢ Telephone part 3/100¢ Generator part 7/100é Typewriter part 10/100€

One reason these costs look good is that they include just the man and machine - no power or overhead. But there is no tricky figuring. In fact, we think the basis is quite conservative. We assumed:

1) 80% efficiency;

2) a wage rate equal to today's

3) a pay-off period of 6000 hours of production - about a year with three shifts or three years with one shift, a fraction of the useful life.

The unit cost on each drawing is the sum of these two figures -

The unit cost of the man:

average U.S. hourly wage hourly gross x 80% efficiency

The unit cost of the machine:

price of tooled machine output in 6000 hours @ 80% efficiency

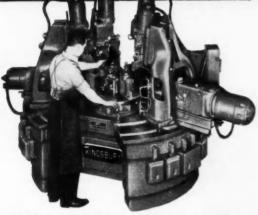
We hold no brief for our assumptions, but we had to assume something. The pay-off period is 6000 hours because most Kingsburys do pay for themselves in one to three years.

If you want to know if a Kingsbury would be a good investment for you, ask us for a proposal. Then figure your unit costs in your own way using your own figures. Even a rough calculation may convince you.

#### Meeting close tolerances

Savings alone don't sell Kingsburys. Other high production machines may match our costs. But how about the quality of the finished parts? In all

#### Generator part lac per part for 19 operations from 2 directions 272 drill 250 c'bore -24 NF tap 189 drill-157 drill-141 drill 125 drill-500 end mill 182 drill - 3 holes no. 12-28 NF tap 213 drill- 2 holes 28 NF tap 328 drill



430 PARTS AN HOUR GROSS. A 20-inch power index table has five fixtures. At the four working stations four horizontal units do the holes in the left view and four units on tunnel columns do the oil hole. Three units have multi-spindle heads.

## Typewriter part 1 c per part for 18 operations from 5 directions 120 drill 4 holes 136 drill-250 c'bore 7 holes 173 drill 140 drill-2 holes .116 drill thru .173 drill-

280 PARTS AN HOUR GROSS. Put one piece in the fixture and trip a lever. The vertical unit clamps it and counterbores seven holes. Then horizontal units operate on four sides. When the clamp withdraws, remove the piece. There is no indexing.

work no equipment excels ours. That is just our opinion, of course, but it is an honest one.

Bushings guide drills and reamers accurately. We locate spindles to in precision ball bearings.

Each index table and its fixtures are jig-bored to minimum tool room tolerances. Each fixture is rugged and grips the part firmly without distortion. The locating points conform to your specifications.

#### We're not in the back woods

Some people who visit us for the first time are surprised at the quality of our equipment and our work.

humility we feel that in this type of Maybe they just don't expect much from people in the New Hampshire hills. Actually we are right between the machine tool centers of Worcester. Mass. and Springfield, Vt.

Our shop has three acres of floor exact indicator readings and run them space, 122 machines under ten years old and employs 316 people with a combined length of service of 3257 years. We have 11 jig-borers and nine boring machines, mostly in a

windowless air-conditioned building with strict control of temperature and humidity.

If you are ever up in these parts and have high production drilling and tapping problems, we hope you will stop in and see us. We make a lot of friends that way.

Sincerely,

Kingsbury Machine Tool Corp. 95 Laurel St., Keene, N. H.

KINGSBURY

AUTOMATIC DRILLING & TAPPING MACHINES for Low-Cost High Production

AUTOMOTIVE INDUSTRIES, July 15, 1952

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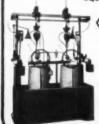
WATERBURY-HALL SPECIALIZED ENGINEERING AND TECHNICAL SERVICE GRADIES TO HELP YOU IN YOUR VALVE SEAT GRINDING PROBLEMS.

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WATERBURY-HALL "SPECIALIST" VALVE SEAT GRINDING
EQUIPMENT WITH NEW FORCE-FEED HEAD



Model AVO. Dual Production Wet-Type Air-oil Lubricated Eccentric Valve Seat Grinder with NEW FORCE-FEED Head—for Radial Type Aviation and Tank Engines. Also available in a Single Spindle Unit for service or production, using the NEW FORCE-FEED Head Mechanism.

NEW force-feed head for faster prinding. Available as original equipment or for conversion.



#### Metals from Ore Concentrates

(Continued from page 53)

tion with Sherritt Gordon Mines Ltd., a nickel-copper-cobalt process has been researched and piloted for that company's Lynn Lake properties. Also processes were tailored for the cobalt concentrates of the Howe Sound Mining Co. and the National Lead Co.

Lower metals prices will not necessarily be the immediate effect of the new processes because of the insistent demands for metals. However, reduced metallurgical treatment costs will permit the economical mining of ore bodies with lower metal content. This, in turn, will permit a considerable increase in metals production.

The announcement follows seven years of intensive research by Chemico, a unit of American Cyanamid Co., and four years of research and pilot plant work by Sherritt Gordon Mines Limited.

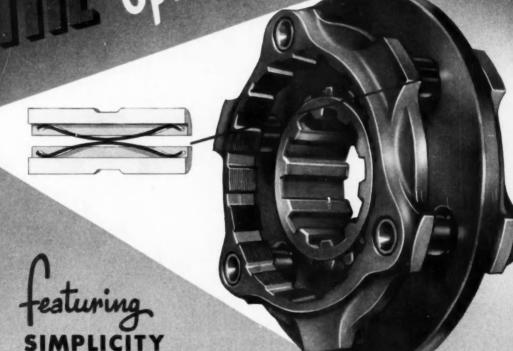
Compared with conventional methods, piloting experience has shown that production cost, from ore concentrates to pure metals, should be considerably below current costs. Other savings may be realized by cutting transportation and personnel costs, and by reducing the present time lag between mining and pure metal.

First commercial use of one of the processes will begin this summer when Chemico expects to complete the building of a \$2.5 million cobalt refinery for Howe Sound Mining Co. near Salt Lake City, Utah. This plant will boost world output of the strategic metal, most of which comes from Central Africa, by more than 40 per cent. The plant will daily process 35 tons of 20 per cent cobalt concentrates from Howe Sound's Blackbird Mine near Cobalt, Idaho, resulting in yearly production of some 2000 tons of pure cobalt, about onehalf the United States' consumption of the metal in 1950.

Also under construction at the Fredericktown, Mo., mine of National Lead Co. is a \$5,000,000 refinery which is scheduled for completion in mid-1953. With a designed capacity of 50 tons of concentrate per day, National Lead Co. plans to maintain an annual production at this plant of 700 tons of cobalt, 900 tons of nickel and 700 tons of copper plus 7500 tons of fertilizer-grade ammonium sulfate.

A unique development is the \$17,-000,000 nickel refinery now under con-(Turn to page 123, please)

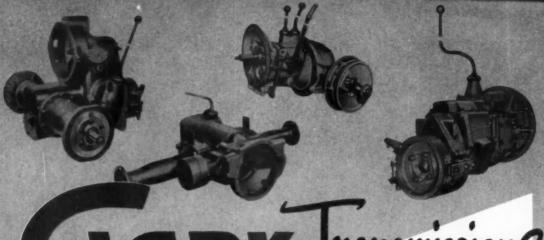
## FRK ANNOUNCES Split-Pin Synchronizer



RUGGEDNESS DEPENDABILITY

CLARK EQUIPMENT COMPANY

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## LARK ransmissions

The "Split-Pin" Synchronizers are new in these two Clark transmissions now availablewhat is not new is the Clark enthusiasm for engineering research, combined with the practical knowledge of industry's needs.

It is this traditional Clark attitude toward design that will continue to produce a full line of standard transmissions, and continue to tackle and solve special problems involving unusual transmission requirements . . . for trucks, buses, farm tractors, industrial trucks, and road building machines.

Products of Clark-TRANSMISSIONS AXLE HOUSINGS



FORK TRUCKS & TOWING TRACTORS SEARS & FORGINGS







FRONT & REAR AXLES FOR TRUCKS & BUSSES 😂 TRACTOR UNITS





#### Metals from Ore Concentrates

(Continued from page 120)

struction for Sherritt Gordon Mines Ltd. at Edmonton, Alberta, in which the Sherritt Gordon ammonia leach process and Chemico's nickel reduction process are combined. The plant, scheduled to begin operation in the Fall of 1953, will turn out mostly nickel and small quantities of cobalt and copper from sulfide ores mined at Sherritt Gordon's Lynn Lake holdings at Manitoba. Annual production at the refinery is expected to be about 8500 tons of nickel, 1000 tons of copper and 150 tons of cobalt, plus 70,000 tons of ammonium sulfate.

Another development that may soon find commercial application is a new process for production of pure copper powder from any form of copper scrap, brass scrap or blister copper. It is said to achieve virtually 100 per cent extraction. The product, better than 99.9 per cent pure, meets all standards for oxygen free, high conductivity electrolytic copper. process, which presented major development difficulties because of the complex chemistry involved, was accomplished by Chemical Construction during two years of close collaboration with Chemetals Corp.

In converting from the old smelting and refining methods to these newly developed processes, it is expected that costs of scrapping existing facilities in many cases can be made up in about three years from operating savings. Material requirements are so moderate in quantity and reasonable in cost that the efficiently and compactly designed commercial plants, may, in many cases be built at the site of the mine. This would drastically cut transportation costs, a sizeable factor in current metals prices.

Smelters and refineries are often hundreds of miles apart, and time lags in production extend over many months, frequently resulting in huge inventories of partially processed material which, in turn, causes serious dislocations in the metals industry.

The new processes permit so close an integration of the time factor, it is claimed, that it is a matter of hours rather than months between the mining of the ore and production of a pure metal ready for market. Refiners using the new processes will prepare a concentrate of the ore by conventional flotation methods, introduce the concentrate as a slurry into

an autoclave along with water and an acid or ammonia and then, from the resulting leach solution, recover the individual metals by the use of suitable reducing agents.

By varying conditions during the treatment, the different metals in the ore are produced separately as pure powders, which may be pressed into forms ready to market, or, in the case of copper, extruded as rods or pipe. The reagents are generally recovered.

Rights to many of the processes are shared by Chemical Construction Corp. with Sherritt Gordon Mines Ltd. During the past four years, Sherritt Gordon has contributed to the entire project by support of parts of the research program, by developing new processes and by building and operating a pilot plant at Ottawa.

Rights to the copper scrap and manganese processes are shared by Chemical Construction with Chemetals Corp.

ORIGINAL EQUIPMENT ON MANY LEADING CARS AND TRUCTS

Thermostats



#### Thermostat Suggestion:

To Automotive Engineers-

- Remember that Dole Thermostats are different in principle and performance.
- It was the advent of the new Dole Thermostat that made feasible the smaller radiators and the sealed cooling systems.
- Dole Thermostats are designed to give top performance on the new cars with high pump pressures.
- Plan and specify Dole Thermostats for both today's cars and those on your drawing boards.

THE DOLE VALVE COMPANY

. CONTROL WITH DOLE

1901-1941 Carroll Avenue, Chicago 12, Illinois Philadelphia • Detroit • Los Angeles



We design and produce them to meet the most exacting needs.

Our Plugs and Sleeves obtainable in diameters from 1/8 inchup. Caps from 1/4 inchup.

Special Sizes and Shapes to meet YOUR needs.

/LUGS to seal off the speed-

to plug up an oblong hole on the manifold assembly.

to slip over the carburetor

a masking protector on fuel

to protect against dust, dirt and lint . . . in storage or in transit to installation.

Also available . . . Chemically Treated Plugs with added strength and stiffness . . . with proper resilience to ensure a clean, tight, dust-proof fit.

Grease proof . . . low moisture absorption . . . noninflammable . . . and are stable up to  $260^\circ$  Fahrenheit.

Attractive Prices! Quick Deliveries!

Consult us on your needs.



#### **Industry News**

(Continued from page 23)

#### New Ford Film Shows Steps in Car Design

Ford Motor Co. has released a new film which will be made available to the public to show how new designs in automobiles are created.

Called "Tomorrow Meets Today," the film shows activities in studios, laboratories, drafting rooms, and test facilities, where new cars are styled, designed, built, and tested before going onto mass production lines.

#### Cass Selected to Head NPA Motor Vehicle Div.

Robert Cass, assistant to the president of White Motor Co., has been appointed director of the Motor Vehicle Div. of the National Production Authority. He succeeds Courtney Johnson, who has returned to his post as assistant to the board chairman and president of Studebaker Corp. George R. Davis was named deputy director.

#### GE Holds Open House at Carboloy Plant

More than 3000 local residents attended an open house held recently by Carboloy Dept. of General Electric Co. at its new cemented carbide tool fabricating plant in Edmore, Mich. The \$1.5 million plant is located on a 33-acre plot and contains 54,840 sq ft of space.

An Alnico permanent magnet plant addition to contain 90,000 sq ft is being constructed nearby. It is expected to be completed by the spring of 1953.

#### Goodrich Tire Passes Air Force Trials

B. F. Goodrich Co. is said to have developed a new aircraft tire that reportedly will withstand more than 50 simulated high-speed jet landings of 250 mph. The tire has completed Air Force tests.

#### Metal Carbides Building Plant

Metal Carbides Corp. has announced that it will commence construction in the near future of a \$1 million plant in Boardman, O.

The new facility reportedly will have a monthly capacity of approximately 25,000 lb of tungsten carbide metal, tungsten alloy heavy-metal, titanium metal and other special alloys made from powdered metals.

(Turn to page 144, please)

## Reduce the use of critical alloys in gas turbine structures

N-A-X AC9115 ALLOY STEEL offers a means of reducing the use of critical alloy steels of the "stainless" type in gas turbine and similar applications. In specific cases it has replaced over half the amount of strategic material originally required, with no sacrifice of quality.

N-A-X AC9115 ALLOY STEEL has high strength and toughness values at temperatures ranging from -70° F. to +1,000° F. It can be readily cold formed into the most difficult shapes; its response to welding by any process is excellent. It must, however, be suitably coated for protection against cold or hot corrosion.

N-A-X AC9115 ALLOY STEEL is available in bars as well as flat rolled products. Investigate the outstanding properties and characteristics of this steel and, through its use, conserve the critical material so necessary to our nation.

**ALLOY STEEL** 

STEEL

NATIONAL STEEL CORPORATION



#### **New Defense Facilities**

Cupplementing the list of Certificates of Necessity issued up to May 13 authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which were published in the June 15 issue, page 96, of Automotive Industries, the following additional certificates were announced by

the Defense Production Administration between May 13 and June 24.

Included in this latest tabulation, 11,129 new or expanded defense facilities of all types have been authorized for rapid tax write-off, the total amount eligible for amortization being \$19,870,509,972. These figures are exclusive of cases that are up for

later review but included in this list—in these cases no dollar amount is listed. The figure appearing in parentheses is the percentage authorized for actual fast tax write-off.

#### -A-

Advance Tool Stamping & Die Corp., Columbus, Ohio Aircraft parts—\$45,964 (70)

Aero Products Co., Farmingdale, N. Y. Aircraft parts—\$4,533 (70)

Aero Supply Mfg. Co., Inc., Corry, Pa. Aircraft parts—297,600 (75)

Aetna Industries, Centerline, Mich. Aircraft & ordnance parts—\$281,800 (70)

Aircraft Precision Products, Inc., Oak Park, Detroit, Mich. Aircraft parts—\$30,000 (65)

Allied Aircraft Co., No. Hollywood, Calif.

Electronic equipment—\$50,662 (65)

All American Airways, Inc., Washington, D. C. (Home office) Aircraft parts—\$14,117 (75)

America Standard Product Co., Hartford, Conn. Aircraft parts—\$64,348 (50)

American Brake Shoe Co., Denver, Colo. Components—\$162,820 (50)

The American Pulley Co., Philadelphia, Pa. Aircraft parts—\$461,500 (65)

Anderson, Inc., Chicago, Ill. Aircraft parts—\$90,000 (65)

The Annin Co., Los Angeles, Calif. Aircraft parts—\$4,046 (80)

The Apex Tool Co. Inc., Bridgeport, Conn. Aircraft engine parts—\$27,945 (70)

Art Metal Construction Co., Jamestown, N. Y. Aircraft parts—\$270,485 (65)

Atlas Body Corp., Philadelphia, Pa. Aircraft parts—\$90,000 (65)

Axelson Mfg. Co., Vernon, Calif. Aircraft parts—\$21,921 (65)

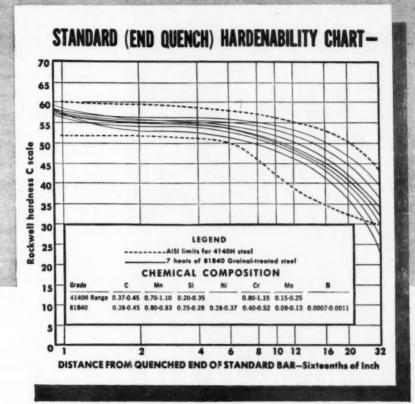
#### -B-

B. H. Aircraft Co., Inc., Farmingdale, N. Y. Aircraft parts—\$29,368 (65)

The Bemco Co., Columbus, Ohio Aircraft parts—\$2,438 (70)

Bendix Aviation Corp., Elmira, N. Y. Ordnance—\$32,485 (65)
Eclipse Machine Div., Elmira, N. Y. Aircraft parts—\$20,340 (65)
Butler County, Hamilton, Ohio Aircraft parts—\$51,269 (65)
North Hollywood, Calif.
(Turn to page 128, please)





Consistent
Hardenability obtained
in Boron Steels
made with
GRAINAL ALLOYS

The most common test for boron steels is measurement of hardenability by the end quench or Jominy hardenability test. Today's steel substitutions are made on the basis of similar hardenability since a reasonable prediction can thus be made of the hardness and strength of a given part.

The curves above show the relationship between the hardenability of a series of seven heats of 81B40 steel and the hardenability band for 4140H steel, which it often replaces. The 81B40 heats were made in one electric furnace shop, and the remarkably consistent hardenability shown by the curves was obtained by the use of Grainal alloy as the means of adding the boron.

Consistent hardenability means consistent strength and hardness after heat treatment, which is the aim of every fabricator. The best proof that the Grainal alloys insure this objective is found in the successful use of three million tons of Grainal-treated steels.

VANADIUM CORPORATION OF AMERICA

420 FEXINGTON AVENUE NEW YORK 17, N.Y. + DETROIT + CHICAGO + CLEVELAND + PILISBURGE





(Continued from page 126)

Aircraft parts—\$34,340 (65)
Besler Corp., Emeryville, Calif.
Aircraft parts—\$60,471 (80)
Biddle Mfg. Co., Inc., Racine, Wis.
Aircraft & ordnance parts—\$25,909 (80)
Blanchat Machine Co., Wichita, Kans.
Aircraft parts—\$36,998 (70)
Boeing Airplane Co., Wichita, Kans.

Aircraft—\$29,933 (65) Seattle, Wash.

Airplanes and spare parts—\$630,112 (65)

Bohn Aluminum & Brass Corp., Detroit, Mich.

Tank and aircraft bearings—\$95,000 (65)

Platinum Works, Detroit, Mich. Engine bearings—\$65,000 (65)

Greensburg, Ind.

Engine bearings for ordnance — \$1,-903,500 (65)

Borg-Warner Corp., Spring Division, Bellwood, Ill.

Ordnance-\$62,374 (65)

Ingersoll Products Div. Ordnance—\$96,090 (65)

Breeze Corp., Inc., Union, Union Co., N. J.

Aircraft parts-\$2,432,000 (65)

William Brewer Machine Co., Hartford County, Conn.

Aircraft and ordnance parts—\$7,593 (70) Buerk Tool Works, Buffalo, N. Y.

Component parts for aircraft—\$11,-220 (80)

Buhl Mfg. Co., Detroit, Mich. Aircraft parts—\$6,695 (65)

Burrite Service, Burbank, Calif. Aircraft parts—\$35,999 (80)

Burton Auto Spring Corp., Chicago, Ill.

Ordnance-\$14,833 (65)

#### -c-

California Cornice Steel & Supply Corp., Los Angeles, Calif.

Aircraft parts—\$96,745 (65)
The Canton Drop Forging & Mfg. Co.,
Canton, Ohio

Aircraft parts—\$84,728 (65)

Carlton Forge Works, Inc., Paramount, Calif.
Ordnance & aircraft parts—\$30,651

(70) Champion Motors Co., New Brighton,

Aircraft parts-\$48,063 (80)

Chiksan Co., Brea, Calif., & Houston, Tex.

Aircraft parts-\$78,398 (70)

Cole Electric Co., Culver City, Calif. Aircraft parts—\$31,741 (65)

Condamatic Company, Detroit, Mich. Aircraft parts—\$55,000 (65)

Cook Electric Co., Skokie, Ill. Aircraft and ordnance—\$229,913 (50)

The Cornelius Co., New Brighton, Minn. Aircraft equipment—\$35,919 (75)

(Turn to page 132, please)



PUBLISHED PERIODICALLY BY HERCULES POWDER COMPANY IN THE INTERESTS OF BETTER FINISHES AND FINISHING

## Twin Coach Lacquers "Convertibles" for Army with One Hot-Sprayed Coat

#### Kent, Ohio, Plant Avoids Thinning, Cuts Finishing Time and Costs

Motor coaches manufactured for the military, that can be converted from ordinary passenger vehicles to first aid or trucking use, have joined the growing list of military items now being finished with hotspray lacquer. Here's why: only one coat needed, application time cut in half, finish is smoother, flow-out is better, blushing is eliminated, and solvents are saved.

Cellulose Products Department

#### HERCULES POWDER COMPANY

964 Market Street, Wilmington 99, Del.



Bus bodies being made ready by cleaning, masking and priming before hot lacquer spraying.



Hot spraying of Army coach convertible under way at Twin Coach Co. plant.

#### Specification Lacquers for Finishing Military Items

Learn more about lacquer for defense finishing. Send for this handy guide to specification lacquers that helps you decide which finish you will need in performing government contracts. Specification numbers are listed, as well as an index to uses.



CL52-3

## Introducing a new gasket ARMSTRONG'S

## Improved beater saturation process combines cork with fiber and rubber to produce unique fiber sheet packing

Armstrong's Accopac is a new, basically different type of gasket material. In applications calling for plant fiber gaskets, it offers greatly improved performance and dependability. In fact, Accopac seals so effectively that in many cases it promises to replace more expensive gasket stocks.

#### Highly compressible

Two things account for most of Accopac's sealing efficiency. The first is the user in it of adequate amounts of cork. The second is a new, patented beater saturation process.

The cork in Accopac adds a high degree of compressibility, as can be seen by the load-compression curves on the facing page. Because of this high compressibility, Accopac works as well on stamped or light flanges as on rough, heavy joints.

In lightweight construction, it conforms to normal irregularities without distorting flanges between the bolts. On rough, heavy flange surfaces, it fills ordinary imperfections to provide a tight, dependable seal.

#### Highly crush resistant

Accopac is effective in heavy flanges for another important reason. It will withstand flange loads up to 100,000 p.s.i, without damage. Conventional fiber materials, on the other hand, often rupture at approximately 25,000 p.s.i, This is demonstrated in a photograph on the next page.

But crush resistance is important not only on heavy flanges. Even on relatively light joints, high spots or lack of parallelism can concentrate much of the bolting pressure on small areas of the gasket. The result may be a load sufficient to crush conventional fiber materials. This offers a possible explanation of the leaker that grows worse rather than better as flange bolts are drawn tighter.

#### Won't shrink, won't grow

The saturants or binders used in Accopac materials are nonvolatile and non-extractable. They will not be lost in service through the action of fluids. Thus an Accopac gasket will not shrink, dry out, and leak in any application for which it is recommended.

Dimensional stability is further ensured by the uniformity of the latex coating on both the fibers and the cork particles. Consequently, humidity changes have little or no effect on Accopac. Gaskets kept for long periods will still fit and will still seal effectively. This is especially important in the case of replacement parts that may be stored for months before use.

#### Fibers locked in rubber

The new beater saturation process used in making Accopac can deposit much larger amounts of rubber on the fibers and cork particles than is possible with any other known method. This rubber coating is uniform and accurately controlled.

The resulting sheets are uniformly tight and impervious. For example, a gasket of Accopac CN-707 easily holds air at 2,000 p.s.i. Test gasket:  $\frac{1}{32}$ " x  $1\frac{7}{8}$ " O.D. x  $1\frac{1}{8}$ " I.D.; flange,  $\frac{1}{2}$ " steel, torque, 70 inch-pounds on four  $\frac{1}{4}$ " bolts; no leakage visible when unit is immersed in water.

#### Users report: "No leaks"

In the past 2 years, rigid field tests have been made in a wide range of industrial and automotive applications. Here are some typical comments from users:

"Completely eliminates oil seepage—keeps motor block clean even in dusty farm applications" (Oil pan gasket on gasoline engines).

"Accopac eliminated leaks which were common with our old plant fiber gasket" (Water pumps).

"Gives a 100% seal" (Cylinder base gaskets).

"Accopac is the only fiber material that gives positive assurance of no leaks" (Gear case gasket),

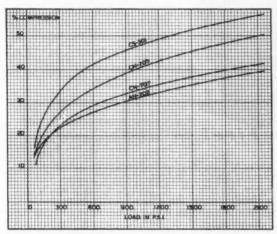
"100% assurance of tight joints and good resistance to corrosion that formerly caused much trouble" (Oil valve control gaskets).

Many other reports tell of highly effective seals, with no leaks or seepage and longer gasket life.

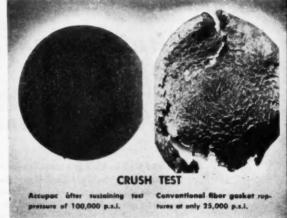
#### WRITE TODAY FOR SAMPLES

Accopac materials come in sheets, rolls, ribbons, or die-cut shapes. If you cut or use fiber gaskets, investigate Accopac, We'll gladly supply samples for testing. Just call your Armstrong representative or write to Armstrong Cork Company, Industrial Division, 5807 Arch Street, Lancaster, Penna,

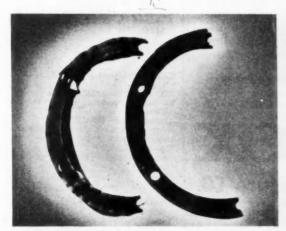
## material ACCOPAC®



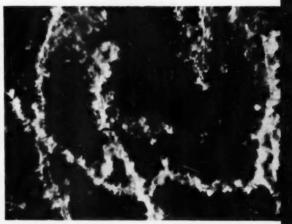
HIGH COMPRESSIBILITY of Accopac is shown by these load-compression curves. With light or stamped metal flanges, this compressibility allows gaskets to conform to irregularities and seal without distorting the flange. On heavy flanges, Accopac gaskets seal without crushing.



HIGH CRUSH RESISTANCE. Crushing loads are often present (even on relatively light flanges) when high spots absorb full bolting pressure. Thus, tightening bolts may actually cause leaks instead on prevent them. Accopac's outstanding crush resistance prevents this.



NEVER SHRINKS OR DRIES OUT. Both these gaskets were used for six months in a gear pump circulating hot hydraulic oil. The plant fiber gasket (left) lost its glycerine plasticizer, dried out, shrank, became hard, brittle. The Accopac gasket (right) remained virtually unaffected.



HIGH RUBBER CONTENT. This microphotograph (100X) shows how completely and how uniformly each fiber and each cork particle is enclosed with latex. Accopac is tight, uniform, homogeneous. Strength is very nearly equal in either direction across the sheet.



Yes, the Men in Authority couldn't see the need—the vital need—for the right kind of fire protection. And fire struck, as always, when least expected—devastating fire that destroyed irreplaceable records, costly machines, buildings and supplies which will take months—months of no production—to build and replace.

Statistics prove that too many fires result from failure to be ready for them—particularly at key operation points where fire can hit like lightning, crippling operations dealing a death blow to production!

Are your operations safe? A survey by Cardox will show you how CARDOX "Low Pressure Carbon Dioxide Systems"\* can protect the danger spots in your plants against fire—eliminate fire extinguishment losses entirely. A few lines on your letterhead will bring full, eye-opening information.

\*Covered by Patents Issued and Pending



FIRE EXTINGUISHING SYSTEMS

CARDOX CORPORATION + BELL BUILDING + CHICAGO 1, ILLINOIS
Offices in Principal Cirles

(Continued from page 128)

Crosley Division — Avco Mfg. Corp., Nashville, Tenn. Aircraft parts—\$140,000 (50)

#### \_ D \_

Danuser Machine Works, Tulsa, Okla. Aircraft parts-14,283 (80) Daystrom Furniture Division of Daystrom, Inc., Olean, N. Y. Aircraft parts-\$51,212 (75) Deere & Co., John Deere Harvester Works Div., East Moline, Ill. Tank track shoes-\$813,594 (65) DeKay Machine Products, Los Angeles, Calif. Aircraft parts-\$24,569 (80) Delavan Mfg. Co., Des Moines, Iowa Aircraft parts-\$37.712 (75) Detroit Harvester Co., Detroit, Mich. Aircraft parts-\$38,000 (70) The Deutsch Co., Los Angeles, Calif. Aircraft parts-\$106,521 (75) Dixon Mfg. Co., Inc., Coffeeville, Kans. Aircraft parts—\$180,573 (75/85) Douglas Aircraft Co., Inc., Bell, Calif. Airplane subassemblies & parts—\$52,-533 (65) Santa Monica, Calif. Airplanes, missiles & parts thereof— \$134.759 (65) Long Beach, Calif. Airplanes & parts-\$243,803 (65) Santa Monica, Calif. Airplanes & parts-\$3,915,307 (65) Santa Monica, Calif. Aircraft & parts-\$150,053 (65) Douglas Aircraft Co., Inc., El Segundo, Aircraft and parts-\$184,267 (65) Long Beach, Calif. Airplanes-\$40,000 (65) Douglas Tool Co., Hazel Park, Mich. Aircraft parts-\$7,483 (65) Durham-Enders Razor Corp., Mystic, Conn. Aircraft parts-\$1,499 (80) Dwyer Products Corp., Michigan City, Aircraft assemblies-\$30,731 (65) Dynamic Air Engineering Inc., Los Angeles, Calif. Aircraft parts-\$7,783 (70) Los Angeles, Calif. Anti-icing & defrosting systems — \$4,182 (70)

#### -E-

Elliott Engineering Co., Lynwood, Calif.
Aircraft parts—\$22,420 (75)
El Sereno Machine Works, Azusa, Calif.
Aircraft parts—\$30,416 (80)
Evans Products Co., Plymouth, Mich.
Ordnance—\$17,038 (70)
Plymouth, Mich.
Ordnance—\$15,756 (70)

#### -F-

Fairchild Engine & Airplane Corp., Suffolk County, N. Y. Aircraft parts...\$140,642 (65) (Turn to page 134, please)



Farmingdale Machine & Tool Co., Inc., Farmingdale, N. Y.
Aircraft parts—\$36,920 (75)
Federal Screw Works, Chelsea, Mich.
Aircraft parts—\$26,310 (50)
Flexonics Corp., Elgin, Ill.
Aircraft assemblies—\$85,979 (70)
Flight Research Engs. Corp., Richmond, Va.
Aircraft parts—\$40,000 (65)

Joel Fox Co., Inc., Los Angeles, Calif.

Aircraft parts-\$25,126 (80)

The G. I. Machine Co., Akron, Ohio Aircraft parts—\$39,542 (65) G-M Laboratories Inc., Chicago, Ill. Aircraft components—\$7,414 (65) Gemco Machine Products, Los Angeles, Calif.
Aircraft parts—\$11,543 (70) General Electric Co., Schenectady, N. Y.

Aircraft components—\$128,084 (65) General Machinery Co., Inc., subsidiary Hamilton Mfg. Co., Inc., New Haven, Conn. Aircraft parts-\$37,499 (80) General Motors Corp., Lansing, Mich. Ordnance-\$2,391,648 (40) Kokomo, Ind. Electronic equipment-\$594,700 (65) Indianapolis, Ind. Ordnance-\$33,404 (50) Dayton, Ohio Aircraft parts-\$66,369 (65) Wayne, Mich. Diesel generator sets-\$189,500 (65) The General Tire & Rubber Co., Wabash, Ind. Gas mask components-\$140,000 (50) Waco, Texas Airplane lifting bags & rafts-\$72,525 (50)

(50)
The Gerstenslager Co., Wooster, Ohio Aircraft parts—\$18,500 (65)
Gibson Refrigerator Co., Greenville, Mich.

Assemblies for airplanes — \$59,074 (70) Gits Bros. Mfg. Co., Chicago, III.

tills Bros. Mfg. Co., Chicago, Ill. Aircraft parts—\$39,555 (75) Gendale Machine & Welding Works, Glendale, Calif. Aircraft parts—\$15,876 (80)

Aircraft parts—\$15,876 (80)
The B. F. Goodrich Co., Akron, Ohio
Tank tracks, fuel cells, military—
\$550,602 (45)

Miami, Okla. Military tires—\$542,059 (25) Troy, Ohio

Aircraft parts—\$314,200 (65) Gruen-Simplex Corp., Woodside, N. Y. Aircraft parts—\$32,432 (80) Grumman Aircraft Engineering Corp.,

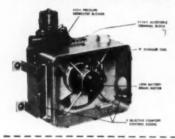
Bethpage, N. Y. Aircraft—\$18,828 (70)

## MEED POWERHOUSE MEAT OUTPUT?



THIS EVANS FRESH AIR
HEATER-DEFROSTER
WAS CUSTOM BUILT
TO DELIVER 25,000
BTU OUTPUT!

### ENGINEERED FEATURES GIVE YOU MORE FOR YOUR HEATER DOLLAR





#### EVANS ENGINEERING MAY HELP SOLVE YOUR PROBLEM

Evans automotive heating and ventilating equipment is custom engineered for each individual installation to provide truly satisfactory heating and ventilating systems for a wide variety of commercial vehicles.

The Evans organization is staffed to engineer units to your specifications, organized to build prototypes quickly, equipped to conduct precision tests to latest A.S.H.V.E. procedures. Military experience dating back to World War I qualifies Evans to work with you in meeting the rigid specifications of the Armed Forces. If your needs are for high performance, ruggedly constructed automotive heating and ventilating equipment — it will pay you to consult Evans Products Company, Heating & Ventilating Division, Dept. P-47, Plymouth, Michigan.



CUSTOM HEATING AND VENTILATING FOR A WORKING WORLD ON WHEELS



#### -H-

H. & A. Tool Co., Detroit, Mich.
Aircraft parts—\$26,480 (70)
H & H Mfg. Co., Inc., Clifton Heights,
Pa.
Aircraft parts—\$44,826 (80)
Hansen-Lynn Co., Inc., Burbank, Calif.
Aircraft parts—\$3,399 (80)
The A. W. Hayden Co., Waterbury,
Conn.
Timing motors for aircraft—\$7,188 (65)
The Herman Machine & Tool Co., Tall-

madge, Ohio Aircraft parts—\$12,529 (80) Hetherington, Inc., Sharon Hill, Pa. Aircraft electrical switches—\$2,619 (65)

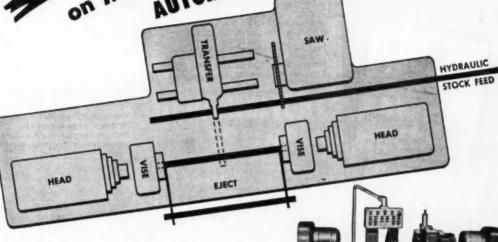
(65)
Holley Carburetor Co., Detroit, Mich.
Aircraft turbine controls—\$5,054 (65)
Hussmann Aircraft Div., Div. of Hussmann Refrigerator Co., St. Louis, Mo.
Air frame components—\$445,409 (65)
Hyland Machine Co., Dayton, Ohio
Aircraft parts—\$28,123 (80)
Hyster Co., Peoria, Ill.

Earth-moving equipment — \$14,053 (60)

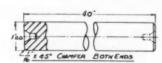
I-T-E Circuit Breaker Co., Sp. Prod. Div., Philadelphia, Pa. Aircraft parts—\$1,144,496 (65)

(Turn to page 136, please)

# Operation Combine". 15 Operation Combine". Notch & Merryweather AutoMATIC TRANSFER MACHINES!

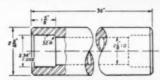


Machine both ends simultaneously and get the cut-off time free on Motch & Merryweather Automatic Transfer Machines. Save time, floor space and money. Get the details on your jobs! No obligation.



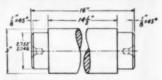
Operation: Cut off, chamfer and center drill both ends.

Material: SAE 1040 ground shafting. Production: 240 pcs/hr.



Operation: Cut off; bore and chamfer inside and outside, both ends.

Material: SAE 1020 steel tubing. Production: 140 pcs/hr. @ 100% eff.



Operation: Cut off, box mill, turn and center drill both ends.

Material: SAE 1020. Production: 140 pcs/hr.

Manufactured by.

THE MOTCH & MERRYWEATHER MACHINERY COMPANY
715 PENTON BUILDING • CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Automatic and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT





(Continued from page 134)

#### -1-

Jack & Heintz, Inc., Bedford, Ohio Aircraft parts—\$160,039 (65) James & Book Co., North Hollywood, Calif. Aircraft parts—\$79,604 (70) Johnson Bronze Co., New Castle, Pa.

Johnson Bronze Co., New Castle, Pa. Diesel engine bearings — \$1,348,200 (65)

#### - K -

Kearfott Mfg. Corp., Newark, N. J. Instruments motors for aircraft—\$16,-629 (75) The Kelly-Springfield Tire Co., Cumberland, Md.

Military tires & tubes—\$517,250 (35) Keystone Engineering Co., Los Angeles, Calif.

Aircraft parts-\$18,323 (70)

#### Lambert Engineering Co., St. Louis,

Mo. (Home Office) Aircraft components-\$380,980 (70) Larson & Quigley Co., Chicago, Ill. Aircraft parts—\$33,000 (65) Lear, Inc., Grand Rapids, Mich. Aircraft parts & instruments-\$38,-922 (75) Liberty Products Corp., Farmingdale, L. I., N. Y. Aircraft parts-\$42,438 (70) Lockheed Aircraft Corp., Palmdale, Calif Aircraft-\$400,000 (65) Burbank, Calif. Aircraft & parts—\$317,647 (65) Lockheed Aircraft Service - International Inc., Richmond Hill & Ja-maica, N. Y. Modification, service & repair of military aircraft—\$47,444 (65) Lord Manufacturing Co., Erie, Pa. Aircraft parts—\$346,872 (70) Lovequest Eng. Co., Los Angeles. Calif. Aircraft parts-\$141,053 (75)

#### -M-

McCulloch Motors Corp., Los Angeles, Calif.
Aircraft components—\$584,348 (70)
The M. B. Mfg. Co., Inc., New Haven, Conn.
Aircraft parts—\$281,588 (70)
MacClatchie Mfg. Co., Compton, Calif.
Aircraft parts—\$23,773 (80)
Magnus Tool and Die Co., Newark,
N. J.
Aircraft parts—\$38,110 (80)

The Marquette Metal Products Co., Cleveland, Ohio Aircraft parts—\$36,599 (75)

Meco, Inc., Paris, Edgar County, Ill. Aircraft parts—\$22,750 (75) Mercury Aircraft Inc., Hammondsport, N. Y. Aircraft assemblies—\$43,142 (65)

(Turn to page 138, please)

ACCO

CHECK

#### Shaped Wire\*

- Flat

Round

M Odd contour

Low or high carbon, stainless, special alloy, Armco. You draw the shape—PAGE can draw the wire.

#### Armature Banding Wire

Tinned stainless or carbon steel. In reels of 50 to 200 pounds. Stainless has high tensile strength, high resistance, low permeability.

#### Lock Safety Wire

Tough, durable, workable.
In the size and type for your work.

#### **Spring Wire**

Any shape\* . . . high carbon . . . hard drawn . . . high tensile . . . stainless . . . galvanized . . . tinned . . . bright.

\*Cross-sectional areas up to .250" square; widths to ½"; width-to-thickness ratio not exceeding 6 to 1.

#### YOU do this-

Give us the specifications of the wire you need—or tell us details of job to be done.

#### WE'LL do this-

Send you recommendations, prices and delivery date. Samples on request. PAGE offers you a wide variety of wires to choose from.

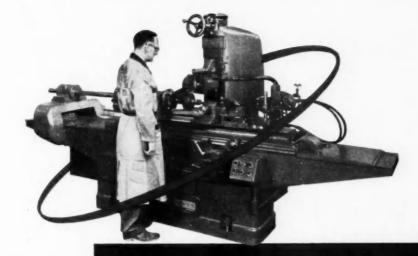
Wire or Write Today

PAGE WIRE



PAGE STEEL AND WIRE DIVISION AMERICAN CHAIN & CABLE

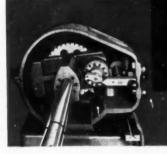
lonessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Portland, San Francisco, Bridgeport, Conn.



Indexing mechanism of the Helical Grinder

#### NEW HELICAL GEAR AND SPLINE GRINDER

Assures Highest Accuracy in both Lead and Tooth Form



The new Red Ring Helical Gear and Spline Grinder, Models SGF-12" and 18", incorporate the lead bar principle thus eliminating the inherent errors, human and mechanical, of conventional methods heretofore used to maintain specific lead or helix angle.

The lead of every gear tooth or spline is exactly alikeexactly the same as that of the precision ground master lead bar which rigidly controls the progressive rotation of the work part as it is traversed under the grinding wheel.

The grinding wheel is dressed to any desired tooth form. That form is controlled by a hardened steel master form plate which guides the movement of the dresser diamonds.



Red Ring Spur Gear and Spline Grinder, Models SGD-12" and SGC-18"

Write for descriptive folder on Red Ring Gear and Spline Grinders both helical and spur.



NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . . . . . . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

(Continued from page 136)

The Metal Equipment Co., Cleveland, Ohio

Aircraft & ordnance parts-\$35,500

Michigan Steel Casting Co., Detroit,

Aircraft parts-\$12,497 (65)

Mid-Western Industries, Inc., Wichita,

Aircraft parts-\$19,917 (65)

Miniature Precision Bearings, Inc., Keene, N. H.

Ball bearings for aircraft-\$183,978

Minneapolis Moline Co., Minneapolis, Minn.

Machine tools-\$39,250 (70)

Morrison Engr. Co., Rancho San Franciscito, Cty., Calif.

Aircraft parts-\$79,302 (70)

Mt. Clemens Metal Products Co., Mancelona, Mich.

Aircraft parts-\$20,000 (50)

Mueller Co., Los Angeles, Calif.

Aircraft parts-\$79,165 (75) Mult-Shel Co., Glendale, Calif.

Aircraft parts-\$154,900 (50)



National Water Lift Co., Kalamazoo, Mich.

Aircraft parts-\$4,394 (70)

The Nippert Electric Products Co., Columbus, Ohio

Aircraft parts-\$32.500 (70)

#### -0-

O & M Machine Co., Inc., Los Angeles, Calif

Aircraft components-\$98,216 (75)

The Oliver Corp., Battle Creek, Mich. Airplane components-\$635,973 (65)

Oro Mfg. Co., Adrian, Mich.

Aircraft parts-\$50,085 (70) John Oster Mfg. Co., Racine, Wis.

Aircraft parts-\$29,037 (75)

Pacific Airmotive Corp., Burbank, Calif.

Aircraft pressure regulators-\$45,250 (65)

Packard Motor Car Co., Detroit, Mich. Aircraft components-\$28,404 (65) The Park Drop Forge Co., Cleveland,

Ohio Crankshafts for airplane engines-\$95,578 (65)

Parsons Tool Inc., Berlin, Conn.

Aircraft parts-\$43,621 (75)

Pattern Products Mfg. Co., Detroit. Mich.

Aircraft parts-\$38,999 (80)

Patton Mfg. Co., Inc., Springfield,

Aircraft parts-\$39,996 (65)

Peerless Engineering Co., Inc., South Gate, Calif.

Aircraft parts-\$47,307 (70)

Perfection Stove Co., Cleveland, Ohio Military winterization equipment -\$86,167 (65)

The Pierce Governor Co., Inc., Anderson, Ind.

Aircraft parts-\$38,147 (70)

Automotive Division

Ordnance-\$30,268 (75)

Plane Parts, Inc., New Haven, Conn.

Aircraft parts-\$11,173 (75)

Potter Aeronautical Co., Newark, N. J. Aircraft equipment-\$65,651 (80)

Procter Electric Co., Philadelphia, Pa. Aircraft parts-\$26,883 (65)

Progressive Machine Co., Huntington Park, Calif.

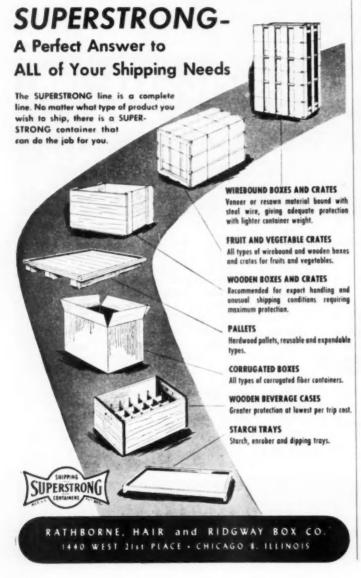
Aircraft parts-\$12,008 (70)

#### -0-

Quality Control Corp., Chicago, Ill. Aircraft parts-\$35,934 (80)

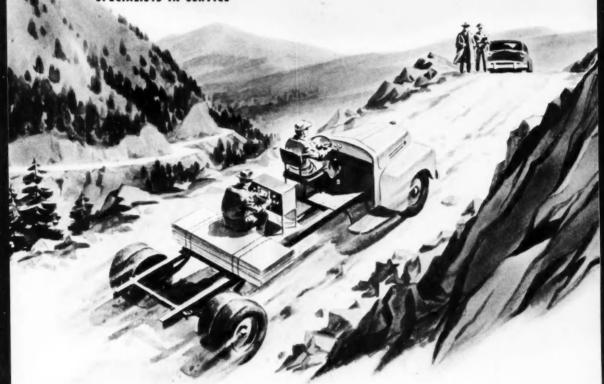
(Turn to page 141, please)

AUTOMOTIVE INDUSTRIES, July 15, 1952



Spicer

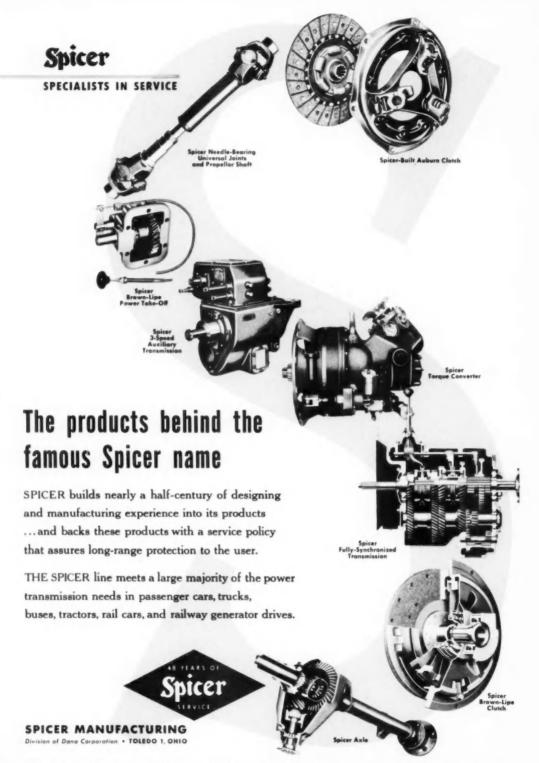
SPECIALISTS IN SERVICE



#### the spirit behind the famous Spicer name

The whole automotive industry knows the Spicer spirit, and the men behind it. They...and the Spicer men before them...have pioneered, engineered, tested and proved many of the outstanding advancements in the automotive power transmission field. They...and the Spicer men before them... have manufactured these units in large volume for availability to every American automotive vehicle ever built. They are men who have kept product above price. Yet they have kept production so efficient that quality standards have never been impaired by quantity schedules. With their heads, their hearts and their hands, these men...and the vast Spicer organization behind them...are working for you.





TRANSMISSIONS - PASSENGER CAR AXLES - CLUTCHES - PARISH FRAMES - STAMPINGS - FORGINGS - TORQUE CONVERTERS - UNIVERSAL JOINTS
SPICER "BROWN-LIPE" GEAR BOXES - POWER TAKE-OFFS - POWER TAKE-OFF JOINTS - RAIL CAR DRIVES - RAILWAY GENERATOR DRIVES

#### -R-

Radiant Mfg. Co., Chicago, III.
Aircraft parts—\$67,423 (65)
Reid Metal Parts Co., Burbank, Calif.
Aircraft and ordnance parts—\$26,615 (80)
Research Tool & Die Co., Maple
Shade, N. J.
Aircraft parts—\$10,872 (80)
Rabertshaw, Fulton, Controls Co.

Robertshaw-Fulton Controls Co., Bridgeport, Conn. Aircraft parts—\$161,072 (70) Knoxville, Tenn.

Aircraft components—\$200,800 (70) Bridgeport, Conn. Aircraft parts—\$17,500 (70) Anaheim, Calif.

### Aircraft components—\$828,678 (70)

The S & K Specialty Co., Cleveland, Ohio Sampsel Time Control, Inc., Spring Valley, Ill. Aircraft components-\$456,300 (65) Saxco Mfg. Co., Los Angeles, Calif. Aircraft fittings-\$10,048 (80) Shakespeare Co., Kalamazoo, Mich. Aircraft parts-\$43,152 (70) Shakespeare Products Co., Kalamazoo, Aircraft parts-\$16,981 (65) Simplex Piston Ring Mfg. Co., Miami, Aircraft parts-\$89,287 (70) Cleveland, Ohio Aircraft parts-\$38,182 (70) Smith-Morris Co., Ferndale, Mich. Aircraft parts-\$104,893 (65) Solar Aircraft Co., Des Moines, Iowa Aircraft parts-\$7,046 (65) San Diego, Calif. Aircraft parts-\$63,907 (65) The Sperry Corp. Sperry Gyroscope Co. Div., Great Neck, N. Y. Control instruments for aircraft -\$1,007,451 (65) Standard Air Lines Inc., Long Beach, Calif.

Aircraft & diesel parts—\$38,418 (80) The Swan Tool & Machine Co., Hartford, Conn.

Airframe components-\$2,579 (80)

Aircraft parts—\$45,573 (80) Stratford Machine Corp., Cleveland,

Calif.

Steven Engineering Co., Los Angeles,

Aircraft parts—\$8,030 (80)
Swedlow Plastics Co., Los Angeles,
Calif.

Acrylic products for aircraft—\$5,733 (60)

#### -T-

Tally Machine & Mfg. Corp., Los Angeles, Calif.
Aircraft parts—(—) (65)
Aircraft parts—\$13,563 (70)
Taper Form, Inc., Burbank, Calif.
Aircraft parts—\$7,158 (80)
(Turn to page 142, please)

# COOLIDGE BALLS CHROME ALLOY STAINLESS STEEL

Finest:
ELECTRIC FURNACE STEEL
HEAT TREATMENT
LAPPED FINISHES

THESE FACTORS COMBINE TO MAKE THE FINEST
STEEL BALLS OBTAINABLE BECAUSE THEY CONTRIBUTE TO GLOSER SURFACE UNIFORMITY—
BETTER STRAIN DISTRIBUTION—HIGHER LOAD
CARRYING CAPACITY—LONGER LIFE

#### Used in:

BALL BEARINGS • AUTOMOTIVE • AIRCRAFT FARM AND INDUSTRIAL EQUIPMENT MACHINE TOOL • OIL WELL AND OTHER IMPORTANT APPLICATIONS

COOLIDGE CORPORATION BOX 488 • MIDDLETOWN, OHIO (Continued from page 141)

Textool Products Co., Inc., Los Angeles County, Calif.

Aircraft parts—\$50,264 (70)
Thompson Products, Inc., Cleveland,
Ohio

Aircraft parts—\$73,912 (65)
Tison Bros., Los Angeles, Calif.
Aircraft parts—\$52,900 (80)
Tool Design & Engineering, Inglewood, Calif.

Aircraft parts—\$51,000 (65) Towle & Son Co., Philadelphia, Pa. Aircraft components—\$34,589 (80) Philadelphia, Pa. Aircraft parts—\$10,720 (80) Trackson Co., Milwaukee, Wis. Tractor equip.—\$10,966 (60)

#### -U-

United Aircraft Corp., Pratt & Whitney Aircraft Div., East Hartford, Conn. Aircraft parts—\$4,080,000 (65)

Research Dept., East Hartford, Conn. Aircraft parts—\$45,000 (40) United Aircraft Products, Inc., Dayton, Ohio

Aircraft parts—\$30,680 (70)

United States Rubber Co., Mishawaka, Ind.

Fuel cells for aircraft—\$87,594 (50)

#### \_ V \_

Victor Flush Valve Co., Newark, N. J. Aircraft parts—\$95,000 (70) Newark, N. J. Aircraft parts—\$65,500 (70) Vidomac Engs. Inc., Culver City, Calif.

Aircraft parts-\$22,235 (80)

#### -w-

The Weatherhead Co., Clendale Div., Glendale, Calif. Aircraft parts—\$66,890 (65) WEBA, Inc., New Hyde Park, L. I., N. Y. Aircraft parts-\$114,000 (70) Weils Aircraft Parts Co., Los Angeles, Calif. Aircraft parts-\$4,173 (80) Westinghouse Electric Corp., Lester, Pa. Gas turbines-\$25,995,436 (50) Lester, Pa. Aircraft components-\$281.139 (65) Weston Hydraulics, Ltd., North Hollywood, Calif. Woodward Governor Co., Rockford, Ill. Governors—\$110,000 (65) Worth Mfg. Co., Los Angeles, Calif. Parts for aircraft-\$38,186 (80) Los Angeles, Calif. Aircraft parts—\$3,300 (80) Wright Machinery Co., Durham, N. C. Aircraft instruments & parts—\$26,-

#### \_ Y \_

887 (65)

The Yale & Towne Mfg. Co., Stamford, Conn. Aircraft & ordnance components— \$140,532 (70)

#### Materials Handling Group Acts on Education Needs

In order that engineering students may better equip themselves for service in the science of material handling, 78 major manufacturers of material handling equipment and 3000 engineers in the field have joined hands with educational leaders to form a College-Industry Committee on Material Handling Education.

The committee's work will have five objectives:

To supply material for use in courses on material handling; to develop new material; to become known as a source of information for material handling courses; to stimulate more teaching of material handling; and to determine from industry what skills it requires of material handling engineers.

#### ONE OF AMERICA'S PRINCIPAL PRODUCERS OF DRILL JIG BUSHINGS

### ANNOUNCES



## Precision Quality Piercing Punches

of premium steel, in two basic types: Water Hardening Tool Steel — and High Speed Steel

The high quality performance of a punch depends upon:

(a) The Correct Quality Steel

(b) Precision Heat Treatment to gain full advantage of its properties

(c) Qualified Workmanship to insure dimensional accuracy

To these basic requirements must be added modern equipment to make possible production at reasonable prices. We have taken every possible step to produce an outstanding punch.

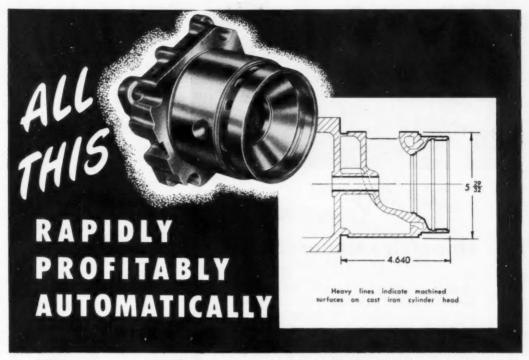
The water hardening tool steel we have selected is guaranteed to definite standards of grain size and depth of hardenability. For "shock absorber" action, the head and upper part of the shank are drawn back to 45-50 Rockwell C in such manner as to have a hardness gradient, rather than a sharp line of demarcation between different sections.

The underside of the head is ground slightly at the same time as the shank. This insures squareness of the underside of the head with the shank, and minimizes breakage during stripping.

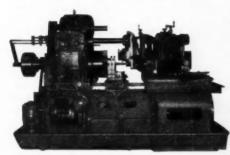
RELATED CONCENTRICITY—As a further example of the "built-in" qualities of A•B•C Precision Punches: the point is ground concentric with the body, within .0005" total indicator reading.

To achieve these A • B • C advantages, plus fine finish and smoothly blended radius to minimize stresses, we developed within our own organization special grinding fixtures and dressing equipment not found in outside markets. And, back of all this is our long record as one of the country's principal producers of premium quality drill jig bushings and fine precision parts for the automotive and other industries.





### POTTER & JOHNSTON 5D Power-Flex



#### AUTOMATIC TURRET LATHE

The 5D Power-Flex — like all Potter and Johnston Automatic Turret Lathes — provides the power, flexibility and automatic operation needed for high output of close toleronce parts at lowest possible unit cost. Extra rigidity and permanent alignment mean long machine life, lasting accuracy and a long-term profit on your original investment.

For high-efficiency production of cast iron components like the cylinder head shown above — today's outstanding machines are Potter & Johnston Automatics equipped with P&J Precision Tooling. Based on more than a half century of specialized experience, this combination is your guarantee of more and better work and fewer rejects.

Interested in added productivity, precision and economy? Send taday for this Bulletin. Remember—P&J engineers can help with your production problems. They'll recommend best combinations of teoling and operation sequence for low cost and high output. There's no obligation.



Precision Production Tooling for over 50 years

## POTTER & JOHNSTON COMPANY PAWTUCKET, RHODE ISLAND

SUBSIDIARY OF PRATT & WHITNEY



DIVISION NILES - BEMENT - POND CO



# where fine gears are produced efficiently • economically!

● At Fairfield, YOUR GEARS are in the hands of specialists equipped with every modern facility for producing fine gears EFFICIENTLY, ECONOMICALLY. By specializing exclusively in "Fine Gears Made to Order" for more than thirty years, Fairfield has become one of America's largest producers of these parts. This is why many makers of construction machinery... agricultural implements... machine tools... military equipment... tractors, trucks, and buses now regularly depend on Fairfield to meet their requirements. For the Best in



#### **Industry News**

(Continued from page 124)

#### RCAF Orders Six Piasecki Helicopters from USAF

The Royal Canadian Air Force has ordered six H-21A helicopters from the U. S. Air Force, according to the manufacturer, Piasecki Helicopter Corp.

Under an agreement with the Dept. of Defense, the helicopters will be delivered to the USAF and then transferred to the RCAF.

### Torque Converters Ready for Caterpillar Engines

Caterpillar Tractor Co. has announced that factory-installed torque converters can be provided for six sizes of its industrial engines. Diesels with converters are being used to power excavators, cranes, railroad switchers, oil drilling rigs, logging yarders, and other equipment.

#### Navy Initiates Steps to Speed Materials

Three major policy steps to speed procurement and production of defense materials have reportedly been taken by the Navy. The first step has been to speed up the process of converting letters of intent to firm contracts.

Second, Naval Inspection offices have been ordered to report production delays and bottlenecks that have not been cleared by routine methods.

Third, the Navy ordered that all offices and bureaus speed the time between requests for bids and beginning of actual production.

#### Willard Pa. Factory Recently Completed

A new \$3 million factory for Willard Storage Battery Co. in Allentown, Pa., was recently completed. Partial production of storage batteries is now under way, and full-scale production is expected soon.

#### Victor Safety Record Awarded Recognition

Victor Manufacturing & Gasket Co, was recently honored for a safety record of more than a million hours.

O. W. Clifton, vice president and works manager, received a safety plaque from James S. Kemper & Co. and Lumbermens Mutual Casualty Co.

(Turn to page 162, please)

MID-STATES FREIGHT LINES, INC., report...

tractors equipped with Wagner Air Brake Systems

are nearing the 300,000 mile mark and are still performing



Read what J. W. Ferguson has to say.

Today, in the highly competitive trucking industry, brake operating efficiency and maintenance economy are factors that must be considered if over-the-road operations are to be profitable. Wagner Air Brakes have a reputation for long trouble-free life. Only the highest quality materials are used in their manufacture. Fewer moving parts mean less friction and wear. Everything in the system from the smallest fitting to the Rotary Air Compressor is designed to give top efficiency. Because they are simple in design, Wagner Air Brakes can be easily serviced and when repairs are needed they can be made in your own shop in a minimum of time. Wagner **Exchange Units and Repair Kits readily** available.

For real brake safety and economy include Wagner Air Brakes as standard equipment on the vehicles you manufacture. Mail coupon for catalog and complete information.

our biggest boosters

June 19, 1951

Wagner Electric Corp. 2411 So. South Park Ave. Chicago, Illinois

Gentlemen:

In accordance with our understanding at the time in accordance with our understanding at the time we started connecting our fleet to Air Brakes and adding more power units with Wagner Air, we take this opportunity to let you know how we feel

We find many of our tractors that you equipped are nearing the 300,000 mile mark and are still performing.

In checking out what few failures we have experienced, we found them largely due to improper

In view of the outstanding performance of units we have equipped with your product I feel free to highly recommend it to all air brake users.

Very truly yours.

MID-STATES FREIGHT LINES, INC

alm w. Fing John W. Ferguson Manager - Highway Operations

JWF/ds

GENERAL OFFICES - STEE SOUTH FULASET ROAD -- CHICAGO 32, ILLINOIS -- PHONE RELIANCE 5-0000



Wagner Products Serve the **Automotive and Electrical Industries** 

LOCKHEED HYDRAULIC BRAKE PARTS and FLUID HOROL.. COMOX BRAKE LINING .. AIR BRAKES . . TACHOGRAPHS ELECTRIC MOTORS . . TRANSFORMERS . . INDUSTRIAL BRAKES

Wagner Electric Corporation 6363 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S. A. (Branches in principal cities in U.S. and in Canada)

Send me copy of Bulletin KU-201 and information on 12 C.F.M. compressors.

COMPANY

**ADDRESS** 

STATE

GET YOUR COPY OF THE NEW



### More Defense Contract Awards

This latest list of defense prime contracts that have been awarded covers the period from May 16 to June 27. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, warplanes, automotive components and spare parts, automotive maintenance equipment, etc.

Unit quantities and dollar amounts

are given for contracts from \$25,000 to \$250,000. Contracts above \$250,000 are indicated by "over \$250,000," but their actual dollar amounts and unit quantities are not available.

#### -A-

AC Spark Plug Div. (GMC), Flint, Mich. Vehicle parts—13,370 ea—\$38,036 Vehicle parts—41,200 ea—\$137,945 ACF-Brill Motors Co., Phila., Pa.

drilling and reaming king pin holes.

Two RH and two LH pieces are com-

pleted at the end of each cycle. Cycling

is automatic, and, operator loads and un-

4 New Davis & Thompson

Mechanical Power Heads

Included in the design of this machine

are the new ROTO-MATIC Mechanical

Electrical Power Heads operated through

screw feed. An important safety feature

of these units is the patented overload

release clutches on the feed. Because of

loads during machine cycle.

Hall-Scott engines-119 ea-Over \$250,-

Active Gear Co., Chicago, Illinois Vehicle parts-5500 ea-\$43,010 Adel Division, General Metals Corp.,

Burbank, Calif. Maintenance parts-400 ea-\$40,265

Aerol Co., Inc., Los Angeles, Calif. Wheel assy.—1500—\$35,835

Aeroproducts. Dayton, Ohio Maintenance parts-various-\$32,331

Aeroproducts Div., General Motors Corp., Dayton, Ohio Motor—various—\$70.767

Aeroquip Corp., Jackson, Michigan Aircraft hose—\$148,609

Ainsworth Mfg. Corp., Detroit, Mich. Vehicle parts-24,000 ea-\$30,240

Airborne Accessories Corp., Hillside,

Maintenance parts-various-\$84,394 Aircraft Tool & Mig. Co., Vassar, Mich.

Vehicle parts-450 ea-\$38,925 Airesearch Mfg. Co., Los Angeles, Calif. Kit assemblies-\$62,525

Repair parts-\$109.538 Valve assy.—various—\$86,700

R. C. Allen Business Machines. Inc., Grand Rapids, Michigan Indicators-6000 ea-\$200,000

Allis-Chalmers Co., Milwaukee, Wisc. Spare parts-var.-\$43.560 Allison Div., GMC. Indianapolis, Ind.

Engines-5 ea-\$90,565 Alloy Products Corp., Waukesha, Wis.

Cylinder assy.-1602 ea-\$277,146 American Air Filter Co., Inc., Herman-Nelson Div., Moline, Illinois Spares—\$162,800

American Auto Parts Co., Inc., Kansas City, Mo.

Vehicle parts-16,500 ea-\$47,850 Vehicle parts-155 ea-\$61,845

American Automotive Products Co., Chicago, Illinois

Vehicle parts-90,000 ea-\$140,625 American Bosch Corp., Springfield.

Mass.

Spare parts—various—\$28,281 Vehicle parts—2050 ea—\$116,809

American La France Foamite Corp. Elmira, New York Spare parts-\$26,842

Andrews-Alderfer Co., Akron, Ohio Valve assy.—\$43,500

AO Smith Corp., Pacific Coast Div., Los Angeles, Calif. Spare parts-\$90,450

The Armstrong Rubber Co., West Haven, Conn.

Tires and tubes-111,793 ea-\$3,064,357 The Autocar Co., Ardmore, Pa.

Spare parts—var.—\$63,028 Truck parts—var.—\$27,924

Auto-Lite Battery Corp., Toledo, Ohio Battery-210,000 ea-Over \$250,000

## **Drilling** and Reaming 388 KING PIN HOLES PER HOUR Station Type Indexing Machine for

On a Davis & Thompson 5 Station Machine

This type MDT FIVE STATION IN-DEXING DRILLER has five fixtures mounted on the index table. Each of these fixtures holds 2 RH and 2 LH automobile front suspension support arms. Four ROTO-MATIC Power Heads, each having four spindles, perform the following operations:

- 1. Drill 53/64" dia.-Half way through. 2. Drill .823" dia. - Balance of way
- through.
- 3. End Cut Ream .8547/.8550" Full length of hole.
- 4. Finish Ream.8635/.8637"-Full length of hole.

the simplicity of their design the units require a minimum of servicing. Free Data

Will be furnished on request.



Davis & Thompson Company 6411 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN \_ B \_

The B. G. Corp., New York, N. Y. Spark plug-9550 ea-\$29,128 Bay City Shovels, Inc., Bay City, Mich. Crane, truck mtd-3 ea-\$72,064 (Turn to page 148, please)

# ÉNGINE PRE-HEATING

#### engine pre-heating

Floods engine components, battery, crankcase, carburetor with warm, heated air. Makes starting easier, faster — even at 65° below!

#### personnel heating

Warm air—independent of engine heat, independent of engine operation—circulates swiftly, evenly, to keep personnel comfortable at all times.

#### windshield defrosting

Keeps windshield reliably "frost-free."

Assures clear vision, safer driving.

• A new application—only in South Wind—brings you this amazing "all-in-one" heater! A small, compact unit...high in output... meeting all the latest military specifications. Assuring efficient vehicle operation under the most stringent weather conditions.

in one heater!

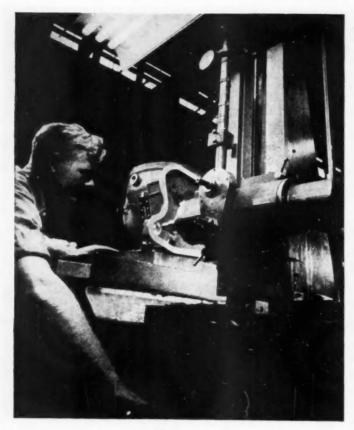
Versutile! Applying with equal performance to trucks, stationery engines, air cooled and liquid cooled engines. Powerful! With an effective, useable output of 35,000 B.T.U.—remarkable in a unit so compact. Adaptable! Burns gasoline, jet fuel or kerosene. Simplified in operation. Easy to install.

Write Today for specific model information or experienced counsel on any phase of heating. Address inquiries to the South Wind Division, Stewart-Warner Corporation, Indianapolis 7, Indiana.

South Wind



PERSONNEL HEATING ENGINE AMD EQUIPMENT PRE-HEATING WINDSHIELD DEFROSTING



## This picture does not equal 10,000 words

This is a fine photograph—but men and machines are only part of the story at IGW. It takes esprit de corps (a much overworked term that fits here)-it takes pride of workmanship to produce fine precision gears and parts.

\* This Horizontal Jig Boror is typical of the high precision tools designed and built by Indiana Gear for their own use.



(Continued from page 146) Crane, truck mtd.-1 ea-\$24,280 Crane, truck mtd.-4 ea-\$97,121 Crane, truck mtd.-12 ea-\$295.888 Crane, truck mtd.-1 eq-\$24,021 Crane, truck mtd.-1 ea-\$24,231 Crane, truck mtd.-2 ea-\$48,560 Bendix Products Div., Bendix Aviation Corp., South Bend, Ind. Main wheel assembly-\$62,531 Injection system—5 ea—\$30,314 Bendix-Westinghouse Automotive Air Brake Co., Elyria, Ohio Spare parts-\$49,552 Vehicle parts-11,800 ea-\$269,774 Ben's Truck Parts. Tacoma. Washington Vehicle parts—42 eg—\$48.300 Biederman Motors Corp., Cincinnati, Ohio Vehicle parts-160 ea-\$32,570 Blackstone Corp., Jamestown, N. Y. Vehicle parts—5,200 ea—\$123,552 Boeing Airplane Co., Seattle, Wash. Maintenance parts-various-\$65,52 Bowen-McLaughlin-York, Inc., York, Pa. Tank recovery vehicle-2 ea-\$93.75 Bowers Sheet Metal Co., Jonesboro, Ga. Vehicle parts-750 ea-\$29,232 Brake Lining Supply Co., Inc., Boston. Mass. Vehicle parts-25,000 ea-\$59,750 Briggs & Stratton, Milwaukee, Wisc. Spare parts-various-\$32,906 Bucyrus-Erie Co., Evansville, Indiana Spare parts—var.—Over \$250,000 Bucyrus-Erie Co., Milwaukee, Wisc. Spare parts-var.-\$95,814 The Buda Co., Harvey, Illinois Spare parts—various—\$148,907 Spare parts-various-\$85,927 Spare parts—various—\$148,482 The Budd Co., Detroit, Michigan Metal parts—Over \$250,000 Vehicle parts—1200 ea—\$35,559 Vehicle parts—2200 ea—\$29,216 Vehicle parts-111,170 ea-\$175,020 Butler Mig. Co., Minneapolis, Minn. Auto parts-3685-\$39,325

California Aircraft Supply Co., Culver City, Calif. Heat exchangers-350 ea-\$64,750 Canadian Commercial Corp., Washington, D. C. Crankshaft assemblies-262 ea-Over \$250,000 Carlisle Corp., Carlisle, Pa. Spare parts—8,210 ea—\$145,460 Tires & tubes—43,340—\$218,985 J. I. Case Company, Racine, Wisconsin Tractor—53 ea—\$73,679 Caterpillar Tractor Co., Peoria, III. Tractor—15 ea—\$247,865 Tractor-5 ea-\$41,599 Tractor-6 ea-\$112,747 Tractor-57 ea-\$961,460 Spare parts-various-\$43,502 Spare parts-various-\$58.214 Spare parts-various-\$1,019.892 Spare parts-various-\$41,311 Spare parts-various-\$128,740 Spare parts-various-\$34,566 Spare parts-various-\$128,961 Spare parts—various—\$697,139 Spare parts-various-\$514,729 Spare parts-various-\$78,913 Spare parts-various-\$674,183 Spare parts-various-\$100,140 Spare parts-various-\$106,068 Chandler Evans Div., Niles-Bement-Pond Co., W. Hartford. Conn.

Maintenance parts - 2660 ea - Over





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ALUMICAST die casting quality assured because of expert scientific control

Here at ALUMICAST, we are equipped with the most modern laboratory and production equipment to turn out high quality die castings as well as permanent mold and semi-permanent mold castings of aluminum or magnesium. Castings that are flawless because every step, from ingot to finished casting, is rigidly supervised and is your assurance of expert scientific control second to none. This value, we call "E.S.C.", is vital to your business because it helps make good products better.

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No matter where you are located, you will find ALUMICAST a quick and reliable source for quality castings. You are cordially invited to consult us relative to your civilian or defense needs. We have sales engineers and representatives in leading cities. If you don't know the name of the one nearest you, write direct to us.

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ALUMINUM and MAGNESIUM PERMANENT MOLD and DIE CASTINGS CONTROL

(Continued from page 148)

Chevrolet Motor Div. (GMC) Detroit. Mich.

Automobile-1159 eq-Over \$250,000 Truck-129 eq-\$195.570

Chicago Rawhide Mig. Co., Detroit. Michigan

Vehicle parts—5000 ea—\$51,524 Chrysler Corp., Detroit, Mich. Engineering studies—Over \$250,000 Clark Cable Corp., Cleveland, Ohio Vehicle Parts Replenishment of Tools-265 ea—\$70,225

Cleveland Diesel Eng. Div., Gen'l Motors Corp., Cleveland, O. parts-var.-\$73,707

The Cleveland Pneumatic Tool Co... Cleveland, Ohio

Strut assy -25 ea-\$58,621

Climax Engine & Pump Co., Clinton, lowa

Spare parts-yar -\$27 197 Spare parts-various-\$49.971

Colonial Plastics Corp., Newark, N. J. Navigator's dome-1264 ea-\$34,128

Continental Motors Corp., Muskegon. Mich.

Spare parts-\$77,445 Spare parts-various-\$27,976 Vehicle parts-6009 ea-\$53,750

Cooper Tire & Rubber Co., Findley, Ohio

Tires and tubes-39,500 ea-\$1,182,235

Cramer Posture Chair Co., Inc., Kansas City, Missouri

Seat assembly-\$35,077

Damar Chemical & Machinery, Shelby, Indiana

Adapter assy.—1883 ea-\$41,792 Dana Corp., Toledo, Ohio Vehicle parts-2800 ea-\$175,969 Vehicle parts-1685 ea-\$39,355

Vehicle parts-75,000 ea-\$55,080 Vehicle parts-4830-Over \$250,000 Vehicle parts-4800 ea-\$62,000

Daybrooke Hydraulic Corp., Bowling Green, Ohio

Spare parts-\$34,922 Spare parts-various-\$63,808

The Dayton Rubber Co., Dayton, Ohio Tires and tubes—39,250 ea—\$1,271,700 Dehler Mfg. Co., Inc., Chicago, Illinois Replenishment of tools-1175 ea-\$138,-062

Deluxe Prod. Corp., LaPorte, Indiana Spare parts-various-\$68.473 Denman Rubber Mig. Co., Warren, Ohio

Tires and tubes-15,000 ea-\$487,050 Detroit Diesel Engine Div., GMC. Detroit, Michigan

Spare parts-\$56,679 Spare parts-var.-\$28,578 Generator set-10 ea-\$48,758

Detroit Diesel Eng. Co., Detroit, Mich. Spare parts—various—\$37,977 Spare parts—various—\$90,270

Deubel Art Tool & Machine, Detroit, Mich. Vehicle parts-1000 ea-\$27,200

Dial Light Company of America Inc., Broadway, New York Indicator lights—\$64,246

Diamond T Motor Car, Chicago, Ill. Vehicle parts-1150 ea-\$37,634 Douglas Aircraft Co., El Segundo Plant,

El Segundo, Calif. Aviation hardware-various-\$67,501

Dow Corning Corp., Midland, Mich. Sealing compound-2500 tube-\$60,500 Dunlop Tire & Rubber Corp., Buffalo,

Tires and tubes-12,000 ea-\$372,480 Dzus Fastener Co., Babylon, New York Cowling fasteners-\$96.466

-E-

Eaton Mig. Company, Detroit, Michigan Vehicle parts-300 ea-\$33,000

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.

Maintenance parts—\$43,508 Fuel flowmeter transmitters-1050 ea -\$188.244

Inverters-1113 eq-\$75,251 Spare parts—191 ea—\$69,621 Regulator & indicator—1058 ea—\$177,-

Regulator & indicator-1288 ea-\$210,-

Maintenance parts-9300 ea-\$74,386 The Electric Auto-Lite Co., Toledo, Ohio

Spare parts-var-\$57,98 Spare parts-var \$53,549

Spare parts-var.-\$36,355 Vehicle parts-6900 ea-\$115,319 Vehicle parts-21,300 ea-\$179,534

Electroline Company, Philadelphia, Pa. Connectors-7925 ea-\$61,481

Erie Mfg. Corp., Milwaukee, Wis. Controller assy.-51,900 ea-\$26,053

-F-

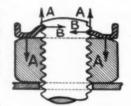
Fairbanks-Morse & Co., Chicago, Ill. Spare parts-var.-\$164,279 (Turn to page 152, please)

THIS NUT WILL STAY TIGHT. ... because it's locked with a PALNU LOCK NUT

With an ordinary nut carrying the load, and a Regular Type PALNUT to keep it tightyou have a powerful fastening team that licks severest vibration. PALNUTS provide absolute security wherever bolt-and-nut assemblies must stay tight-on structural members or engine parts. Low in cost, light in weight, require small space, assemble speedily with hand or power drivers.

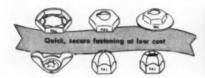
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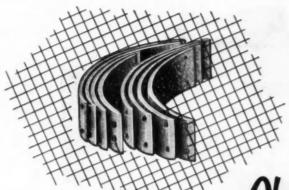


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Powerful spring tension (A-A) is exerted upward on the bolt threads and downward on the ordinary nut, while slotted jaws (B-B) close in and grip the bolt like a chuck.







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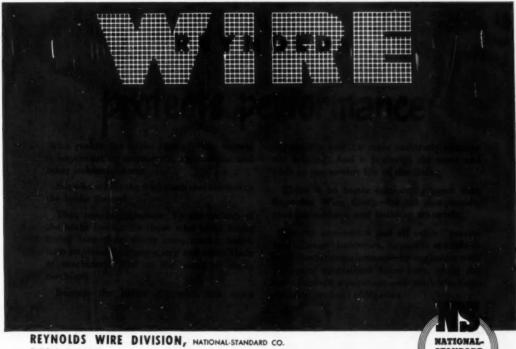
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#### -G-

Vehicle parts-6500 ea-\$91,975 Gar Wood Industries, Inc., Wayne, Mich. Vehicle parts-1930 ea-\$34,088 Vehicle parts-585 ea-\$84,906 Vehicle parts-2700 ea-\$78,678 Vehicle parts-1555 ea-\$43.070 Gemmer Mfg. Co., Detroit, Michigan Vehicle parts-18,500 ea-\$145,43 General Body Mig. Co., Kansas City, Mo. Vehicle parts-3716 ea-\$141,542 General Electric Co., Phila., Pa. Generators—607 ea—Over \$250,000 Generators & control box assys—45 ea -\$245,086 Indicator-tachometer-148 eq-\$74.017 General Electric Co., Schenectady, N. Y. Tachometer Indicator-\$222.46 General Motors Corp., Detroit, Mich. Spare parts-var.-\$50,214 General Motors Corp., Oldsmobile Div., Lansing. Michigan Rocket HE—\$924,000 GMC Truck & Coach Div., Pontiac. Mich. Vehicle parts—10,000 ea—\$211,749 Vehicle parts—14,000 ea—\$26,600 Vehicle parts-2100 ea-Over \$250,000 GMC United Motors Service Div., Detroit, Mich. Battery-218,430 ea-\$4,881,165 The General Tire & Rubber Co., Akron,

Wheel assembly-743 ea-\$46,091 The G & O Mig. Co., New Haven, Conn. Vehicle parts—1700 ea—\$122,044

The B. F. Goodrich Co., Akron, Ohio Fuel cell fittings—\$128,430 Retread casings—2617 ea—\$107,000 Deicer boots-1435 ea-Over \$250,000 The B. F. Goodrich Co., Dayton, Ohio Wheel assembly-\$68,164 B. F. Goodrich Co., Washington, D. C. Tires-airplane—295 ea—\$28.379 Goodyear Tire & Rubber Co., Akron,

Ohio Brake assembly-Over \$250,000 Maintenance parts-35 ea-\$52,850 Tires-airplane-310 ea-\$30,539 Brake assy.-1116 ea-\$95,374 Brake & wheel assys -- 294 ea -- \$81,150 Great Lakes Mfg. Corp., Hammond, Indiana

Windows-plastic cockpit - 2129 ea -\$131,572

Greer Hydraulic, Inc., Brooklyn, N. Y. Stand test dilutes demand oxygen regulator-34 ea-\$36,935

(Turn to page 154, please)



DPANCHES, CLEVILAND . DALLAS . DETROIT - LOS ANGILES . MEMARE . MEM ORICANS . SEATTLE . TOLSA



(Continued from page 152)

Hall-Scott Motors Div., ACF-Brill Motors Co., Berkeley, Calif.

Repair-\$160,200 Harval Truck Equipment, Los Angeles, Calif.

Automotive repair parts-16 line items -\$44 139

The Heil Company, Milwaukee, Wis. Spare parts\_various\_\$93 346 Hercules Motors Corp., Canton, Ohio Vehicle parts-5250 ea-\$98.913 Vehicle parts-21,000 ea-\$38,640 Spare parts-various-\$711.492 Spare parts-\$37,054

Vehicle parts-8600 ea-\$43,606 Vehicle parts-400 ea-\$103,756 Vehicle parts—38,300 ea—\$90,195 Vehicle parts—9500 ea—\$111,183 Highway Trailer Co., Edgeton, Wis.

Auto parts-\$57,392 Auto spare parts-\$29,289 Holley Carburetor Co., Detroit, Mich. Maintenance parts—686 ea—Over \$250,-

Ernest Holmes Co., Chattanoga, Tenn. ehicle parts-9169 ea-\$85,0 Frank G. Hough Co., Libertyville, Ill. Tractor-10 ea-\$88.097

-1-

Industrial Experimental & Mfg., Detroit,

Vehicle parts-1425 ea-\$30,969 Illinois Auto Elec. Co., Chicago, Illinois Vehicle parts-1100 ea-\$27.68 International Harvester Co., Chicago, Spare parts-var.-\$145,431 International Harvester Co., Detroit.

Vehicle parts-2100 ea-\$36,597 International Harvester Co., Ft. Wayne, Indiana

Trucks-Over \$250,000 International Harvester Co., Power Div., Melrose Park, Ill. Spare parts-various-\$92,069

Spare parts—various—\$144.464 International Harvester Co., Washington. D. C.

Truck-1001 eg-\$1,580,057 Trucks—128 ea—Over \$250,000 Truck—50 ea—\$175.839

#### \_\_ \_ \_\_

Jack & Heintz, Inc., Cleveland, Ohio Electrical starters-333 ea-\$84,737 Generator-160 ea-\$109,208

#### - K-

K-D Lamp Division, Noma Electric Corp., Cincinnati, Ohio amp assemblies-\$26,150 Kenworth Motor Truck, Seattle, Wash. Vehicle parts—660 ea—\$30,477 Truck—7 ea—\$139,521 Kiekaefer Corp., Cedarburg, Wis Spare parts-various-\$53,047 Kimble Glass. Vineland. New Jersey Replenishment of tools-8300 ea-\$31,-154 Kollsmand Instrument Corp., Elmhurst.

L. L. N. Y. Indicator-4443 ea-Over \$250,000 Andrew Koski Co., Detroit, Mich. Vehicle parts-670 ea-\$26,565

Lear, Inc., Grand Rapids. Mich. Spare parts-23 itm-Over \$250,000 Lee Tire & Rubber Co., Conshohocken,

Tires and tubes—37,547 ea—\$1,162,292 Spare parts—51,000 ea—\$2,419,950 The Leece-Neville Co., Cleveland, Ohio pare parts-\$97,932

R. G. LeTourneau, Inc., Peoria, Ill. Spare parts—var.—Over \$250,000 Spare parts var.—\$141,366 Spare parts-various-\$27,891

Lipe Rollway Corp., Syracuse. N. Y. Vehicle parts—1940 ea—\$843,837 Littleford Bros., Inc., Cincinnati, Ohio Spare parts-various-\$33.028 Lockheed Aircraft Corp., Burbank, Calif. Ground handling equipment-52 ea-

#### -M-

McClearly Tire & Rubber Co., Indiana,

Tires and Tubes—21,000 ea—\$579,600 Spare parts—7205 ea—\$330,565 McDonnell Aircraft Corp., St. Louis, Misgouri

Spare parts-131 ea \$40,765 Mack Mfg. Co., Plainfield. N. J. ehicle parts-140 ea-\$37.545 Mackenzie Awining Co., Detroit. Mich. Vehicle parts-3300 ea-\$35.658 The Mansfield Tire & Rubber Co., Mansfield, Ohio

Spare parts-51,100 ea-\$2,514,631 (Turn to page 156, please)

PHILLIPS degreasers used by Air Force for removing Cosmoline DEGREASING

**EFFICIENCY** PROVED IN WORLD WAR II

BACK in the early days of World War II the government saw how important high speed removal of Cosmoline was to the war effort. The U.S. Air Forces' use of Phillips degreasers for handling one of the toughest metal cleaning jobs is proof that Phillips degreasers can and will help you increase production by solving your metal cleaning problems efficiently and economically. Out of the complete line you can

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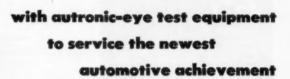


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Engineers of Sun, Oldsmobile and the Guide Lamp Division of General Motors-manufacturers of the Autronic-Evehave worked closely together to develop the necessary test equipment to assure accurate adjustment and reliable performance of this exciting new automotive device.

Extreme sensitivity of the Autronic-Eye calls for the highest sensitivity and precision in the SUN AUTRONIC-EYE TESTER. The TESTER not only measures Dim Sensitivity and Hold Sensitivity but Aiming and Levelling as well-quickly and accurately.

The AUTRONIC-EYE TESTER, a necessary aid in factory installation and servicing of the Autronic-Eye, is another example of how SUN Engineers help meet the testing problems of the industry. In car, truck and tractor factories, in automotive, aircraft and marine engine plants and in the factories of component parts manufacturers across the country, other SUN Equipment is being used for the testing of engine and other accessories to determine compliance with factory specifications.

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neer in your area ready to give you a free demonstration in your own plant

(Continued from page 154)

Maremont Auto Prods., Detroit, Michigan Vehicle parts-800 ea-\$51,680 Marquette Metal Products Co., Cleveland, Ohio Windshield Wiper Assy-\$30,360 The Glenn L. Martin Co., Baltimore, Md. Parts-100 ea-\$257,408 Mechanics Universal Joint Division.

Rockford, Illinois Vehicle parts—3100 ea—\$35,782

Micro Switch Div. of Minneapolis-Honeywell Regulator Co., Phila., Pa. \$27 887 witch-various Military Div. (GMC), Muskegon, Michi-

Vehicle parts-385 ea-\$51,459 Vehicle parts-1750 ea-\$28,741

The Mohawk Rubber Co., Akron, Ohio Tires and tubes—19,425 ea—\$633,837 Spare parts—52,195 ea—\$3,256,239 Monadnock Mills, San Leandro, Calif.

Cowling fasteners—\$65,643 Monroe Auto Equipment Co., Monroe, Michigan

Bracket assembly-2688 ea-\$72.471 567 eq-2688 eq-567 eq

Motor Wheel Corp., Lansing, Michigan Shell-440,000-Over \$250,000 Mott Haven Truck Parts, Inc., Bronx. N. Y.

Vehicle parts-43 ea-\$51,170 MRS Mig. Co., Flora. Miss. Tractor-158 ea-\$3,179,242

#### -N-

North American Aviation, Inc., Columbus Div., Columbus, Ohio Spare parts—11,566 ea—\$74,293 Spare parts—381 ea—\$35,151 Northwestern Auto Parts Co., Minneap-

olis. Minn. Vehicle parts-13,000 ea-\$82,550

#### -0-

The Oilgear Co., Milwaukee, Wisconsin Vehicle parts-200 ea-\$86,875 Vehicle parts-200 ea-\$55,600 Oshkosh Motor Truck, Inc., Oshkosh. Wisconsin

Vehicle parts-101 sets-Over \$250,000

#### -P-

Pacific Airmotive Corp., Mfg. Div., Burbank, Calif. Valve-158 eq-\$51 580

Pacific Car & Fdry Co., Renton, Washington

Crane-7 ea-\$29,073 Pacific Division, Bendix Aviation Corp.,

North Hollywood, Calif. Valve assembles-\$27,624 Pacific Tire & Rubber Co., Oakland,

Calif. Spare parts-28,000 ea-\$1,375,080

Pesco Products Div., Borg-Warner Corp., Bedford, Ohio

Maintenance parts-\$161,479 Fuel booster pumps-\$230,708

Petroleum Accessories, Inc., Pur-O-lator Products, Inc., Ringtown, Pa. Maintenance parts \$96,329 Pettibone-Mullikan Corp., Chicago, Ill.

.oader-14 ea-\$128,800 Phaostron Co., South Pasadena, Calif. Generator field control relay-3512-

Relay-various-\$61,294

Precision Automotive Components Company. St. Louis. Mo. parts-140,000 ea-\$180,600 (Turn to page 159, please)

SCREWS . BOLTS . NUTS SPECIAL FASTENERS

#### Help Lower Unit Production Cost to Meet Competition Profitably...

Simplified screw driving, bolt setting and nut running mean lower cost. This is possible with Pheoll products because they are inspected through all manufacturing steps from coil wire or bar stock to the finished product.

All threads, whether rolled or cut, are carefully gauged to American Standards. Screw and bolt heads are formed, slotted or recessed to meet rigid engineering requirements. Overall quality of the finished product is uniformly high. Precision head formation on all bolts as well as engineered slots and recesses in all screws means less wrench and driver slippage.

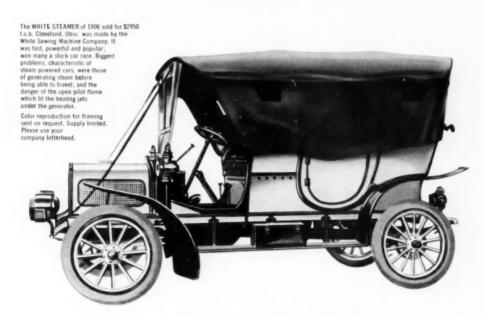
Pheoll engineers will recommend the correct type, size and finish of standard or special screws, bolts and nuts for your needs.

#### WHAT PHEOLL INDUSTRIAL | CHECK THESE PHEOLL FASTENERS MEAN TO YOU | PRODUCTS FORYOUR NEEDS

- Simpler and speedier assemblies.
   Less worker fatigue more units.
   Improved product
- Improved product appearance.
   Added latitude in product design.
   Immediate and dependable source for standardized, interchangeable screws, bolts and nuts especially suited to mass production.
- ☐ Machine Screws □ Sems
- Tapping Screws Square Head Set Screws Threaded Cutting
  - Cap Screws Phillips Recussed Head Screws ☐ Machine Bolts Wing Nuts







### "They gave us curtains for a change in the weather... ...but we used them for a change at the beach!



"Ah, Herman my friend . . . those golden summers I shall never forget! I close my eyes and there before me is my old White Steamer. Then pleasantly I recall how Mildred and I drove to the seashore on many a warm, bright weekend.

The car never left our garage in winter, nor when the rain fell, but we used the big gray storm curtains to good advantage when the time came to swim!

"We were very proud of the clean white finish, neatly trimmed in green. These were distinctive colors and made our car appear very important indeed! Believe me, Herman, every eye on the beach was on that beautiful car."

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LONG MANUFACTURING DIVISION

Borg - Warner Corporation
DETROIT 12, and WINDSOR, ONT.



(Continued from page 156)

Proof Industries Corp., Cleveland, Ohio Vehicle parts—16,600 ea—\$37,682

#### -R-

Radio Corporation of America, RCA Victor Div., Camden, New Jersey Altimeters—110 ea—\$66,857 Reading Batteries, Inc., Reading, Pa. Battery—55,003 ea—Over \$250,000 Reo Motors, Inc., Lamsing, Michigan Kits for truck—475—\$66,293 Rob ins Tire & Rubber Co., Inc., Tuscianbia, Alabama

cı mbia. Alabama Spare parts—35,660 ea—\$1,133,067 Tires & tubes—71,650 ea—Over \$250,000 Romec Division, Lear, Inc., Elyria, Ohio Spares —\$37,469

#### -5-

Sales Div. (Gates Rubber Co.). Detroit.

Tires and tubes—7700 ea—\$241,241 Schaffer Air Industries, Inc., Long Island City, N. Y. Propeller control—431 ea—\$47,766

Scintilla Magneto Div., Bendix Aviation Corp., Sidney, New York Spare parts—\$126.552 Magneto assy.—492 ea—\$427.570 Seeger Refrigerator Co., St. Paul. Minn. Fuel tanks—10,000 ea—Over \$250,000

Seiberling Rubber Co., Akron. Ohio
Tires and tubes—38,625 ea—\$1,100,040
Sheller Mig. Corp., Portland. Indiana
Vehicle parts—11,000 ea—\$39,600
Simmonds Aerocessories, Inc., Tarrytown, New York
Spare parts—\$58,347
Instrument maintenance parts—23 items

\$25.333
Skinner Purifiers Div., Bendix Aviation Corp. Detroit, Michigan
Maintenance parts—52 itm—\$69.040
Son-Chief Electrics, Inc., Winsted, Conn., Tube, pitot—4083 ee—\$48.996

Sperry Gyroscope Co., The Sperry Corp., Great Neck, N. Y.
Indicator—530 ea—\$266,808
Studebaker Corp., South Bend, Indiana
Trucks and parts—Over \$250,000

#### -T-

| Trainer National Spring Co.. New Castle. Indiana | Vehicle parts—5800 ea—\$25.810 | Triplex Corp. of America. Pueblo. Colorado | Vehicle parts—48.664 ea—\$48.664 | Vehicle parts—1600 ea—\$34.254 | Vehicle parts—21.340—\$57.659 | Troy Sunshade Co.. Troy. Ohio

Vehicle parts-2865 ea-\$60,499

#### - U -

United Aircraft Corp., Hamilton Standard Div., E. Hartford, Conn.
Overhaul part—316 ea—\$150,100
Propeller blades—118 ea—\$119,020
United Auto Parts Co., Inc., Kansas City, Mo.

Vehicle parts—40,000 ea—\$50,850
United Engine & Mch. Co., San Lean-dro, Calif.

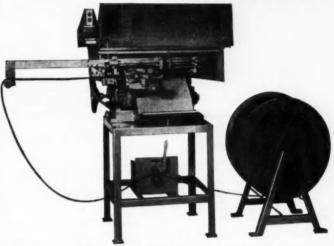
Vehicle parts—3200 ea—\$111,520 United Motors Service. Div., Gen'l Motors Corp., Detroit, Mich. Spare parts—var.—\$73,114

(Turn to page 160, please)

### Measure, Cut and Strip Insulated Wire

OPERATION

on ARTOS Automatic MACHINES



Does your production require cutting and stripping of insulated electric wire, cord, cable, etc.?

You can produce finished leads much faster... as many as 3000 per hour in 15-in. lengths... on this Artos Automatic Machine. Substantial savings are obtained over the best manual or semi-automatic methods.

Operation is fully automatic—wire is taken from the reel, measured, cut to length and stripped at one or both ends. Unskilled help can handle the machine. Set-up is easy for different wire types, cut lengths and stripped lengths.

#### MODEL CS-6E CAPACITY

Finished Pieces Per Hour—From 3000 per hour up to 15 in. lengths to 500 per hour in 64-97 in. lengths.

Maximum Stripping Length— $1\frac{1}{2}$  in. at each end (greater stripped lengths are special).

Muximum Cutting Length-97 in.

Minimum Cutting Length—2 in. (also as short as % in. under certain conditions).

Types of Wire Hendled—Practically all types of solid or stranded single conductor wires, parallel cord, heater cord, service cord, etc.

Maximum Wire Size—No. 10 stranded or No. 12 solid.

#### Other Artos Machines

The complete line of Artos automatic wire cutting and stripping machines will handle cut lengths from 1 in. to 60 ft., stripped lengths to 6½ in. at one end and 8½ in. at the other, wire from No. 12 to No. 000 gauge, and up to 3600 pieces per hour. Ask for recommendations on your problems.



#### WRITE FOR BULLETIN

Get the complete story. Write for Bulletin 35-C on Artos Model CS-6 machines.

**Automatic Wire Cutting and Stripping** 



ING CO.

2753 S. 28th St.

Milwaukee 46, Wis.

# for custom-engineered



look to. EP

Since 1909, the job of The Electric Products Company has been to create and develop special electrical rotating equipment... motors and generators to do existing jobs better or to reach into new fields to do jobs that couldn't be done before. The natural "by-product" of our more than 40 years of specialization is that you get equipment designed and built to the exact requirements of your application... equipment that has greater dependability, longer life and that requires less maintenance.

Send in the coupon below for detailed information about our Custom-Engineered synchronous motors and generators . . . d-c motors and generators . . . induction motors . . . battery chargers . . . frequency changers.

A nation-wide sales engineering and service organization stands ready to meet all User requirements.

## THE ELECTRIC -PRODUCTS COMPANY-



STATE

\* . . . . . . . . . . . . . . . .

(Continued from page 159)

Spare parts—var.—\$46,958 Vehicle parts—8875 ea—\$45,193 Spare parts—\$215,803 Battery—45,000 ea—Over \$250,000

Battery—45,000 ea—Over \$250,000
The U. S. Axle Co., Inc., Pottstown. Pa.
Vehicle parts—3000 ea—\$31,200
U. S. Motor Truck Sales, Detroit. Mich.
Vehicle parts—15,000 ea—\$59,550

Vehicle parts—15,000 ea—\$59,550
United States Rubber Co., Detroit,
Mich.
Tires—airplane—310 ea—\$30,082

United States Rubber Co., Mishawaka, Ind.

Fuel cell fittings—\$226,558
United States Rubber Co., New York.
N. Y.

Aircraft hose—\$56,998 Aircraft hose—Over \$250,000 Hose—\$125,854

#### -V-

Valve Division. Detroit. Michigan Vehicle parts—15,000 ea—\$53,550 Vickers. Inc., Div. of Sperry Corp., Detroit. Mich. Accumulator—272 ea—\$108,927

#### -W-

Wagner Electric Corp., St. Louis, Mo. Vehicle parts—30,500 ea—\$69,418 Ward LaFrance Truck Corp., Elmira, N. Y.

Vehicle parts—250 ea—\$33,730 Vehicle parts—400 ea—\$45,140 Vehicle parts—4700 ea—\$52,281 Vehicle parts—3725 ea—\$41,113

Waukesha Motor Co., Waukesha, Wisc. Spare parts—var.—\$154,682 Westinghouse Electric Corp., Aviation

Gas Turbine Div., Phila., Pa.
Maintenance parts — 69,858 ea — Over
\$250,000

Westinghouse Electric Corp., Lima, Ohio Transformers—\$30,855 Weston Electrical Instrument Corp.,

Newark, New Jersey
Indicator—4434 ea—Over \$250,000
White Motor Company, Cleveland,

Vehicle parts—500 ea—\$30,272
Willard Storage Battery Co., Cleveland.

Battery-2500 ea-\$26,175

#### U. S. Rubber Scientists Complete Test Chambers

Scientists at U. S. Rubber Co. recently completed construction of hot and cold "torture" chambers to roast and freeze rubber and plastic aircraft parts up to 600 F and down to -80 F below in their search for better materials to withstand extremes of temperatures.

Inside the chambers are electrically driven contrivances which bend, stretch, and otherwise punish the products for many hours in the extreme heat and cold.

Products passing the tests are guaranteed to weather many extremes of climate. They are also designed to resist heat generated by the plane's motors and exhaust.



#### or Released in an Instant



Faster assembly . . . no more failures of fasteners. GREER STOP NUTS hold firm against jolts, shocks, shimmy, wobbles . . . any vibration, any kind.

Bolt threads are gripped tightly . . . these famous nuts never work loose. Yet an ordinary hand wrench gives instant release. The tough, built-in GREERCOID collar does it . . . and seals against fluid leakage, too!



Study your fastener problem. Over 3000 types and sizes. Consult GREER. Proved on thousands of products. Meets gov't and military specifications.



GREER STOP NUT CO. 2620 Flournoy, Chicago 12, III.





### WITH MICABOND TAPES

Here's flexible, uniform mica tape that will work in even the toughest application! Here's why: C-D-F Micabond tapes are made from the finest mica splittings carefully placed, bonded and supported to prevent insulation "leaks". C-D-F Micabond tapes are made with many different backings including: fiberglas, silk, cellophane, cotton, and paper. There's a grade of Micabond tape for almost every application.

C-D-F makes other Mica products, too—Sheets, tubes and formed parts are used in the entire electrical industry. C-D-F is a leading manufacturer of quality mica "V" rings, washers and commutator segments.

Your C-D-F sales engineer can be very helpful to you; his experience will save your time and money. Call him today (offices in principal cities)—he's a good man to know!

Continental-Diamond Fibre Company

NEWARK 2, DELAWARE





annealing and galvanizing unit. This is a com-bination EF gas fired radiant tube and elec-trically heated installation and is over 400 feet

for hot or cold rolled, high or low corbon, stainless, silicon, tinplate, aluminum, brass, bronze or any other ferrous or nonferrous strip-for bright annealing, normalizing, galvanizing, aluminizing, tintype best suited to your plant, process, product or production requirements. No iob is too large or too unusual.

up to experienced engineers—it pays.

THE ELECTRIC FURNACE CO. WILSON STREET, SALEM, OHIO

We are in position to design, build and put in operation: continuous strip lines ning or any other process-in the size and

Put your production furnace problems

Gas Fired, Oll Fired and Electric Furnaces



WASHERS and **STAMPINGS** 

Standard and Special Washers, of every description, from every kind of material, any desired finish . . . designed for every purpose . . . utilizing more than 22,000 Sets of Dies.

Let us Quote on Your Needs.



MILWAUKEE 7, WISCONSIN

#### **Industry News**

(Continued from page 144)

#### Vanadium Opens Part of New W. Va. Plant

Ferro silicon for the steel industry started flowing recently from the first electric arc furnace of the new, unfinished, \$8 million plant of Vanadium Corp. of America, near New Haven. W. Va.

Four more furnaces are scheduled to be placed in operation shortly. Said to be among the largest and most efficient in the alloy-producing industry, they are 22 to 25 ft in diameter, with three huge electrodes in each.

#### French Auto Output Climbs Bit Higher

During the first four months of 1952, French automobile production increased 17.1 per cent, compared with the corresponding period of 1951, to reach a total of 172,655.

A breakdown shows 124,257 passenger cars, 46,798 trucks, 931 buses and coaches, 541 road tractors, and 130 special vehicles. Renault led in passenger cars and trucks, while Chausson was the biggest producer of buses and coaches.

#### **Metals Laboratory Dedicated at MIT**

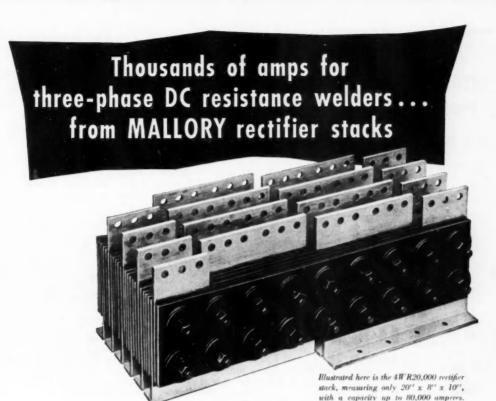
Dedication exercises for the new Metals Processing Laboratory at the Massachusetts Institute of Technology were held recently before a group of scientists, industrialists, and educators.

The new building, provided by a gift of \$1 million from the Alfred P. Sloan Foundation, Inc., is said to mark a step of significant progress in education and research in all types of metal forming and machine tool work.

#### **Dow Stockholders** to Vote on Split

Share holders of Dow Chemical Co. will vote on a three-for-one common stock split at the annual meeting Aug. 27. The proposal is that each share of outstanding common stock of \$15 par value be exchanged for three shares of new \$5 par value common

Directors of the company have recommended that the authorized common stock be increased from 12 million \$15 par shares to 50 million shares of \$5 par vadue, and that outstanding shares be exchanged for the new stock at the three-for-one rate.



Supplying heavy DC welding currents for three-phase resistance welding machines—up to 80,000 amperes—is no small problem. It was solved by Mallory magnesium-copper-sulphide rectifier stacks, specifically designed for this application. Due to the exceptionally high current capacity of these rectifier stacks, the complete power pack—both transformers and rectifier stacks—is so small that the complete assembly can be mounted in standard welding machines.

High operating temperatures and severe duty cycles make this a tough assignment...but Mallory rectifier stacks take these conditions in stride. They maintain their high efficiency, and roll up records of thousands of hours of service without down-time. A unique property of Mallory rectifier stacks proves particularly valuable in welding applications. The stack is self-regulating; that is, it automatically adjusts itself to take care of changes in resistance of the work being welded. This characteristic simplifies adjustment of the welding controls.

Resistance welding is but one of the many varied applications for Mallory rectifier stacks. Their unusual qualities make them the ideal choice for battery chargers, electroplating and other uses where an efficient, completely dependable DC power supply is required. Many standard and special designs are available.

For complete technical information, write or call Mallory today.

## MALLORY

#### SERVING INDUSTRY WITH THESE PRODUCTS:

Electromechanical — Resistors \* Switches \* Television Tuners \* Vibrators Electrochemical — Capacitors \* Rectifiers \* Mercury Dry Batteries Metallurgical — Contacts \* Special Metals and Ceramics \* Welding Materials

P. R. MALLORY & CO., INC., INDIANAPOLIS 6, INDIANA

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio.

If you have an

AUTOMOTIVE
PROBLEM
in production,
assembly, packaging,
shipping

You can save time and money with the proper use of



For masking, holding, packaging, backing, hinging, protecting, reinforcing, identifying, splicing, sound-proofing, insulating, stenciling, bundling, sealing, binding

USE SEAMLESS

F. O. S. Industrial Tape



#### Call or Wire

collect for authoritative advice and suggestions. Prices, catalogues, samples on request Tape to meet govt. specifications. Wire details collect for 24-hour reals.

"Originators of Pressure-Sensitive Industrial Tapes"



WIRE INDUSTRIAL TAPE DIV. E
THE SEAMLESS RUBBER
COMPANY

NEW HAVEN 3, CONN., U. S. A.

#### MEN in the NEWS

(Continued from page 25)

Borg-Warner Corp., Ingersoll Products Div.—George E. Prifold now heads the LVT section.

Ross Gear and Tool Co.—Harry M. Denyes has become Detroit sales representative.

National Motor Bearing Co., Inc.— Ezra Mosher was recently named chief research engineer.

Pacific Airmotive Corp.—Charlotte De Armond has been made director of public relations, while J. T. Berger heads industrial relations.

Waldrip Sales Co.—John B. Waskey is now assistant to the president.

Armstrong Advertising Agency— William B. Pettinger has joined the organization.

General Electric Co.—James M. Mc-Garry is now manager of the News Bureau.

General Tire & Rubber Co.—A. R. Carr has become manager of passenger tire sales, while J. A. Beckett now heads Kraft system sales.

Townsend Co. — Joe S. Thompson has been appointed vice president, while H. E. Chilcoat succeeds him as general sales manager.

Freightliner Corp.—William F. Le-Fevre, Jr., was recently made chief engineer.

Alloy Precision Castings Co.—S. E. Flenner, Jr., is now general sales manager.

Cleveland Chain & Mfg. Co.—D. J. Owens has been chosen sales manager.

Houdaille-Hershey Corp.—Theodore R. Oakes and Gerald C. Caltarelli have been elected directors, while Frank G. Fisher was recently appointed vice president and assistant general manager.

Westinghouse Electric Corp., Apparatus Div.—Joseph S. Parry, Jr., has become assistant manager.

Lockheed Aircraft Corp., Georgia Div.—M. A. Truslow has been named plant engineering representative.

Tube Reducing Corp.—John D. Judge is now president.

U. S. Steel Co.—James M. Darbaker was recently made director of distribution and availability.

Boeing Airplane Co.—Dr. Thrift G. Hanks has become medical director.

Dow Chemical Co., Western Div.— M. F. Ohman is now assistant general manager.

Hobbs Manufacturing Co., Fastener Div.—Philip A. Blair has been chosen assistant sales manager.

Mack Trucks, Inc.—Richard C. Croft has been named to the board.

Damascus Tube Co.—Grant H. Mckay, Jr., and R. L. Kelley are now chief engineer and service manager. respectively.

Westinghouse Electric Corp.—J. C. Fink was recently made engineering manager of industrial products, while F. D. Weatherholt is sales manager.

Libbey-Owens-Ford Glass Co., Fiber Glass Div.—J. M. Johns is now general manager.

Gabriel Co.—Barbara Quigley has been chosen manager of the Export Div., while Gloria Compo is sales-service-promotion supervisor.

Westinghouse Electric Corp., Special Products Development Div.— Myron Ceresa has been chosen manager of electroplating projects.

Mack Motor Truck Corp., Central Div.—Arthur E. Santow has been named national accounts manager.

Brunswick Ordnance Corp.—Frank C. McManus is now vice president and general manager.

International Nickel Co., Inc.—E. M. Kline has been made general manager of the Huntingdon, W. Va., works.

Heli-Coil Corp.—Ted C. Gorman is now purchasing agent.

Kennametal, Inc.—Dan Reebel has been appointed manager of advertising and public relations.

Republic Steel Corp., Steel and Tubes Div.—W. J. Resiner was recently made manager of stainless steel tubing sales.

Eicor, Inc.—Ray Watkins has been appointed executive vice president.

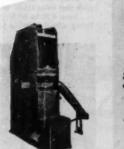
Testworth Laboratories, Inc.—Dr. William Higbee has been promoted to vice president in charge of research.

O.K. Industry...

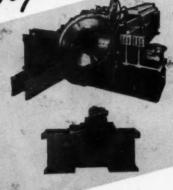
O.K. Industry...

we accept challenge.











## of Broaching Machines and Broaches,

is also the world's largest. Not every company that is oldest is the largest — but LAPOINTE happens to be one that is.

Did we say "happens"? It was no accident. It's the result of a continuing challenge!

50 years ago, with the founding of LAPOINTE, the broaching method of metal-removal was first offered to the world. Through broaching, repetitive accuracy was now possible, while at the same time accomplishing an amazing speedup in production.

When World War I came along, LAPOINTE engineers met the challenge of war production demands. The Second World War required even

greater production, and the maintenance of still closer tolerances. Here again, LAPOINTE successfully met the challenge.

Today, under the intense pressure of an expanding defense program, industry has naturally turned once more to LAPOINTE. Jet engine components and certain other items could not be mass produced without broaching. We are meeting this challenge, as we did the others, with an impressive background of engineering experience in building broaching machines, tools and fixtures. We can do the job ... complete!

Write for our condensed Catalog No. 10

THE

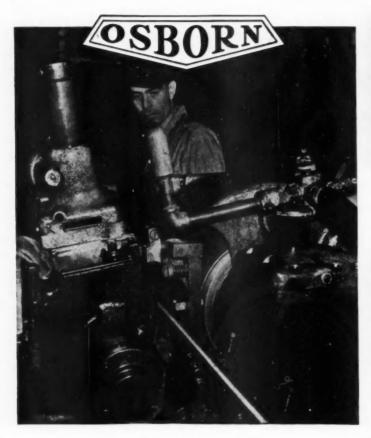
LAPOINTE

**MACHINE TOOL COMPANY** 

HUDSON, MASSACHUSETTS . U. S. A.

LAPOINTE

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES





This wachive does double duty. For removal of metal to close tolerance, it is a centerless grinder. Then, for finishing the surface to microsmoothness it is a centerless brusher. Its conversion takes only a few minutes.

In the operation shown above, nickel-moly steel rods for pumps, are being finished by an Osborn Fascut Brush. Prior to brushing, the same machine with a grinding wheel in place of the brush made a rough grind, taking off .006 inch, and a finish grind, taking off .002 inch. Results of the Centerless Brushing: Produces a smoother finish. Reduces wear in pump packing. Reduces corrosive action on rods; makes them last longer.

An Osborn Brushing Analyst helped develop this improvement. Ask your OBA to help you on all problems of cleaning and finishing! Call him today or write The Osborn Manufacturing Company, Dept. 767, 5401 Hamilton Avenue, Cleveland 14, Obio.



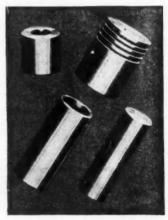
OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES



THE SET-UP. This shows the centerless grinding machine which also serves as a "centerless brusher". These pump rods vary from 1½ in. to 1½ in. diameter . . from 6 ft. to 36 ft. in length. Regulating wheel speed is 52 r.p.m.



ANOTHER JOB. Here Centerless Brushing finishes cast iron pistons to microsmoothness. Simplifies assembly operations and increases life of pistons and cylinders. Output of this machine is 10,000 pieces per 8 hours.



TYPICAL PARTS which are being improved by Centerless Brushing include pistons, piston pins, bushings, tubing . . . any cylindrical parts. It can be applied to many sizes of parts and types of material on a mass production basis.

## Supplier to Studebaker Since 1915



Studebaker, now celebrating its centennial, always has been famous for its high standards. Yes, since 1852, Studebaker has been synonymous with quality in vehicles that make the most of engineering and manufacturing advances.

Since 1915, BCA Bearings have been original equipment on Studebaker cars and trucks. For

thirty-seven years, BCA engineering has made important contributions to Studebaker's reputation as a pace setter in the automotive industry.

Whatever your bearings requirements, specify the best—BCA Bearings. They are performance proved.

BEARINGS COMPANY OF AMERICA

LANCASTER . PENNSYLVANIA





Radial, Angular-Contact, Thrust BALL BEARINGS



The Pullmax Trimmer can be used for straight cutting, circle cutting and irregular template cutting. The circle and straight attachment bars are easily removable for inside cutting, square, irregular and design holes in bulky stampings, such as automotive fenders, aircraft gas tanks, wing sections and other intricate parts.

The lower tool holder is pneumatically operated by a foot pedal, leaving the operator free to work with both hands when inserting bulky parts with flances.

A national concern purchased a Pullmax machine for engineering and template cutting. Based on actual production figures, this machine paid for itself in six weeks. The shearing action performed by the reciprocating upper tool and stationary lower tool leaves an edge requiring little or no further finishing.

Cutting Capacity in mild steel - 5/32"

Speed of Cutting Tools -

For light material - 3400 strokes per

For heavy material - 1700 strakes per min.

Accessories:

Straight cutting attachments Circle cutting attachments



AMERICAN PULLMAX

2465 N. SHEFFIELD AVENUE

#### WORKING MACHINES IN THE WORLD MARKET



Two sizes Pullmax AM and AL—capa-cities up to 16

## PULLMAX

DOES A MULTITUDE OF DIFFERENT JOBS



It's a simple matter to do many different types of sheet steel and plate cutting and working with a Fullmax machine when it is equipped with several tools and attachments. This is the machine that sagained such pepularity for its ability to cut sheet at plate with a recipracating upper tool that leaves an edge that requires no further finishing. Many companies are using Fullmax machines for small production runs, engineering and development work or forming of metal without the cost of expensive dies.



Pullmax D-3-cutti capacity up to 9/32".

Pullmax P-3 has ca-pacity up to 5/32"



**PULLMAX MACHINES WORK:** 

Mild Steel Stainless Steel

Wire Mesh Plastic

Non Ferrous Metals

and other materials

WRITE FOR LITERATURE AND PRICES

No sheet metal department is complete without a Pullmax !



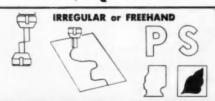


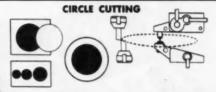


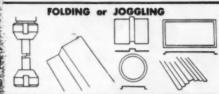




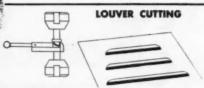












CHICAGO 14, ILLINOIS

you cut costs—
improve your products
with

## pre-coated Thomas Strip

Costs go down—product quality goes up, when you use Thomas pre-coated strip in stamping and drawing lightmetal parts. Savings show up in almost every direction,

It has a clean, smooth-surface finish which eliminates the cost of preparation before fabrication. In many instances, all that is necessary is to fabricate and assemble, as cleaning, plating, and buffing operations are not necessary. Often the tightly adhering, non-ferrous coating serves as the final finish. The coating also acts as a die lubricant, increases die life, reduces wear and cuts retooling costs. It protects the base metal during manufacturing processes.

In addition to these many cost saving advantages, pre-coated Thomas Strip improves products by providing a uniform finish on products inside and out. It adds substantially to product life and appearance, at low cost.

To lower operating costs and increase product acceptance use pre-coated Thomas Strip. For assistance in selecting the most desirable coating for your products from the wide variety listed below, write today.

Cold-rolled strip steel electrolytically pre-coated with Zinc, Copper, Brass, Nickel, Lead-Alloy and Chromium in Natural, Planished and Buffed Finished—Hot Dip Tin and Lead Alloy Coated—Lacquer Coated in Colors—Annealed Spring Steel—Alloy Strip Steel Uncoated Strip Steel. Carefully produced to your specifications.

# Thomas Strip

Pittsburgh Steel Company

Thomas Strip Division · Warren, Ohio





CHIKSAN COMPANY • BREA, CALIFORNIA • Chicage 28, Illinois • Newark 2, New Jersey
Well Equipment Mfg. Corp. (Division), Houston 1, Texas • Chiksan Expert Company (Subsidiary), Brea, Colifornia • Newark 2, N. J.



Both the Dimensionair and the master ring are constant. Only the dimension of your workpieces can vary. Because the Dimensionair is a precision measuring instrument with a constant scale value, only a single master is required to check the zero location. Don't let past customs mislead you. The Dimensionair is the only air gage built with enough precision to permit you to use a single master.

## When the Plug Wears You're Still Safe with the Dimensionair. FIRST. This is so because the Dimensionair's greater measuring range allows

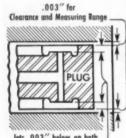
FIRST. This is so because the Dimensionair's greater measuring range allows greater clearance which in turn results in less plug wear. (The Dimensionair Range is .003" on a 2500 to 1 magnification.)

**SECOND.** Only jet wear can change calibration. Dimensionair jets can't wear because they are deeply recessed into the plug body. (On Dimensionair Plugs each jet is .003" below the plug surface.) Hence, a plug can be worn a great deal more than usual without any fear of wearing into the face of the jets.

**THIRD.** When a plug eventually wears to the danger point you will be warned because the gage will clearly show that the readings are no longer stable when you test the plug in the master ring.

**FOURTH.** Because the jets are located so much deeper than has been customary, they are protected from damage and because the jet holes are larger, there is less danger of the holes becoming clogged with dirt.

A single master is common practice in using Dial Indicators and other types of precision indicating gages. The inherent precision of the Dimensionair makes it possible for you to continue this practice. Those who already own Dimensionairs find this to be true. It is worth your while to learn how satisfactory it is to use the Dimensionair. FEDERAL PRODUCTS CORPORATION, 1267 Eddy Street, Providence 1, Rhode Island.



Jets .003" below on both sides of plug. (Total .006")

MORE RANGE

MORE WEAR

FEDERAL

Largest manufacturer devoted exclusively to designing and manufacturing <u>all types</u> of DIMENSIONAL INDICATING GAGES



## KELSEY-HAYES

Leads the New Car Trend to Low Pedal

# POWER-BRANKG



...for right or left foot with safer

#### **Vacdraulic Control**

More and more car manufacturers are following the new trend to power braking that permits the use of much lower, faster-acting types of brake pedals.

Kelsey-Hayes "Vacdraulic" power units, already standard equipment on over 200,000 passenger cars, provide the most advanced type of "feather-touch" control, assuring perfect "pedal feel" for safe, effortless, fast braking action by either right or left foot!

(Let Kelsey-Hayes engineers give you) complete details of "Vacdraulic's" superiorities)



ASSURES PROVEN PRODUCTS A

KELSEY-HAYES

DETROIT 32, MICHIGAN



PRODUCTS: Wheels— Hub and Drum Assemblies—Brakes—Vacuum Brake Pawar Units—for Passenger Cars, Trucks, Buses—Electric Brakes for House Trailers and Light Commercial Trailers—Wheels, Hubs, Axles, Parts for Farm Implements

PLANTS, Kelsey-Hayes Plants in Michigan (4), McKeespart, Pa Las Angeles, Calif., Davenpart, Iawa, Windsor, Ontario, Canad



OF THE AIRCRAFT INDUSTRY

"Eternal Vigilance is the Price of Liberty" . . . these words, today, have a deep, personal meaning to every freedom loving American. And, again, the aircraft industry plays an important role in furnishing the "eyes" to keep this vigilance and the "muscle" to deliver a telling blow for freedom, if the need should arise.

In the aircraft industry, like most other businesses, unbiased preference for a particular product or machine tool is based on performance and a high regard by the purchaser for the manufacturer's ability to build top-quality equipment.

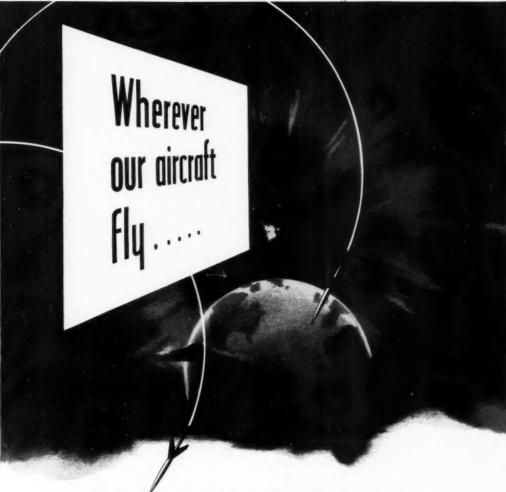


H-P-M is proud that the majority of giant hydraulic presses, ranging in size from 5000 tons to 7000 tons, purchased by the aircraft industry, are H-P-M Fastraverse Presses. And, H-P-M is truly grateful to the aircraft industry for this overwhelming vote of confidence in our company and the presses we produce.

> Through continuing research and proper application of the knowledge we have gained through 75 years of specialized experience in our chosen field, hydraulics, we shall endeavor to remain . . . first choice of the aircraft industry!

HYDRAULIC COMPANY MFG. 2006 MARION ROAD MOUNT GILEAD, OHIO, U.S.A.

Builders of Presses for the Metal Warking & Processing Industries . Plastics Molding Presses . Die Casting Machines . Hydraulic Pumps, Valves & Power Units



They depend on welds made on Sciaky Spot and Seam Welders

Over 90% of all aircraft welding to military specifications is done on Sciaky Machines.

The preference for Sciaky Machines is the BEST PROOF of the quality of Sciaky Equipment.

"See Sciaky for Quality"



4915 West 67th Street, Chicago 38, Illinois
Plants at

CHICAGO . LONDON . PARIS





#### The Moral:

Just as the Peacock in Aesop's fable excelled in beauty of plumage but not of voice, so does no single cutting fluid excel in every desired characteristic.

For example, in machining tough, stringy materials, a cutting fluid must have high antiweld characteristics to prevent scuffing and resultant poor surface finish. However, on free machining materials the anti-weld requirement must be balanced for maximum tool life consistent with desired finish.

The fable simply points up the fact that there is no *universal* cutting fluid to give best results on every job.

The Stuart Oil Co. and its representatives offer you no compromise products. They are prepared to help you correctly select and apply the cutting fluids that will give you the best possible results on *your* particular work.

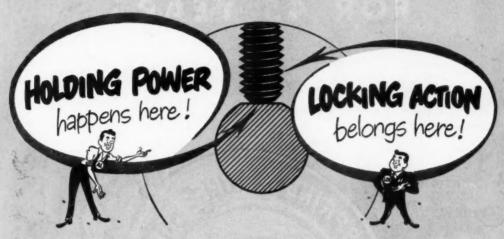
More Than a "Coolant" is Needed

D.A. Stuart Oil Co.

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS
2727 S. Troy St., Chicago 23, III.

	SEND	FOR	вос	KLE	т,	ntitled	More	Than		'Coolan	t" is	Neede
	-	CL	IP T	0 Y	OUR	COA	IPAN	LET	TER	HEAD	AND	MAII
		to	D. A.	Stua	n Oi	Co.,	Ltd., 27	27 \$.	Tray	St., Ch	icago	23, 111.
-		Yo	ur Na	me .	****			****	***	*****	****	*****
		Tie	le			****					****	

#### WHEN YOU SPECIFY SET SCREWS, REMEMBER ..



To do its job a set screw must hold firmly against both rotation and sideway motion, and it depends entirely on the point for this holding action.

Allen O screws hold better because they have the strength to permit firmer tightening, and because the points are designed *only* to produce maximum holding power.

Allen design does not compromise the holding power of the point in an attempt to make it perform a locking function too. Allen 0 screws require no locking action at the point, because of their high uniform accuracy of fit, pitch

diameter and perfect thread lead. This provides maximum thread contact with ample friction to lock the screw in position during use and re-use under extreme vibrating stress.

THE BUY WORD IN SOCKET SCREWS IS ALLEN





# Sign of Superiority FOR 45 YEARS



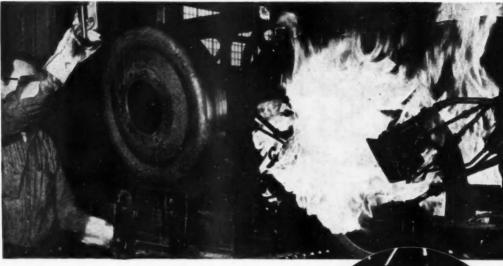
Facilities of 13 Strategically Located Plants of L. A. Young, World's Largest Manufacturer of Springs and Diversified Wire Products for American Industries for 45 Years Are In Defense Production for Both Government and Industry.

#### L. A. YOUNG SPRING & WIRE CORPORATION

GENERAL OFFICES: Detroit 11, Michigan . . . IN CANADA: L. A. YOUNG INDUSTRIES, Ltd., Windsor, Ont.

13 PLANTS: 3 in Detroit, Mich. • Chicage and Joliet, III. • Trenton, N. J. • Memphis, Tenn. Leeds, Ala. • Los Angeles and San Leandro, Calif. • Windsor, Toronto and Montreal, Canada





# HEAT TREATING IS ONE OF THE INTEGRATED OPERATIONS GEARED TO FAST, LOW-COST PRODUCTION

### at Firestone

A flash! — then quick heating and quenching on this specially designed heat treating equipment provides for proper conditioning of steel to its specific use. This operation, which assures high-speed, accurately controlled and uniform results, is part of the integrated, straight-line, low-cost production of large steel stampings at Firestone, It will pay you to figure with Firestone on your metal stampings and sub-assemblies. Write Metal Stampings Division, Firestone Steel Products, Akron I, Ohio.



Roller conveyors and overhead handling systems eliminate production bottlenecks and assure continuous, straightline, low-cost production in all Firestone Steel Products operations.



Multi-operation presses are set up to save time by providing continuous flow of material under constant inspection.



Large-bed-area presses capable of high volume production accommodate large heavy-gauge stampings.

Enjoy the Voice of Firestone on Radio and Television Every Monday Evening over NBC

Copyright, 1952, Firestone Steel Products Co.

#### It's been a fast 10 years for PESCO too!

... keeping up with G. E. Jet development When General Electric completed America's first aircraft jet engine in 1942, and jet-powered flight became a reality, a PESCO fuel pump made certain that it was fed all the fuel it needed.

During the 10 years since then, PESCO has designed and built a pump model for each jet engine model that General Electric has developed.

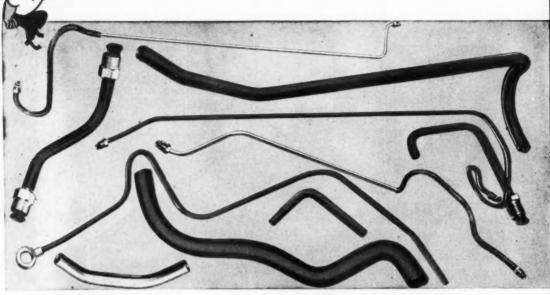
PESCO is proud of this record . . . a record of design, engineering and production that ment of the jet engine.



NORTH MILES ROAD

BEDFORD, OHIO

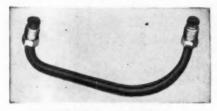
# Your greatest automotive





#### COSTS CUT

You save in the constant search for lowered production costs on your specific automotive part at Bundy. Fabricating the bead and bend in oil level indicator above formerly required two separate operations. Now the two are combined in one Bundy-engineered step, and costs of unit reduced accordingly.



#### PRODUCTION SAVINGS

You save in the continual improvement of basic production steps within Bundy, as well. Assembly of flare nuts in end-to-end alignment on tubing lengths, as above, formerly a tedious hand operation, is now expedited by Bundy-developed automatic nut assembler. Savings go right on to Bundy customers.

#### **FABRICATION SAVINGS**

Shooting for lowered manufacturing costs, better automotive performance in your new designs? Bundy engineers can help work out the easiest, most practical ways to fabricate new lines and tubing parts in double-walled Bundyweld. Often make substantial extra savings by showing how to use less tubing, where to take production short-cuts. You save because Bundy men "can do!"



#### PERFORMANCE SAVINGS

You save, too, with Bundyweld's dependable, trouble-free, safe performance the life of your automotive equipment. Sturdy, more resistant to failure from vibration, extra-rugged and -strong, Bundyweld is used in the fuel, oil and brake-line systems of 95% of today's cars . . . evidence of its dependability.

## tubing buy on every count

Tubing features second to none, priceless, time-proved, safe performance, plus engineering skills that cut costs to the bone, yours when you specify Bundyweld Tubing

When specifying tubing for brake lines and other automotive applications, look beyond the question of cost-per-foot. Look at all that you buy in Bundyweld Tubing

In the last 20 years, 360,000 miles of Bundyweld Tubing have been used in the brake-line systems of cars, trucks, tractors and buses in all price ranges. You buy *safety*, proved in the billions of miles traveled by these vehicles.

Here is the only tubing double-walled from a single strip, copper-bonded through 360° of wall contact. No other tubing has all of Bundyweld's features because of this one-of-a-kind design. Bundyweld is extra-sturdy and -strong, highly resistant to brutal shock and vibration fatigue.

You buy the world's finest automotive tubing, feature-wise.

Bundyweld hits your assembly lines clean as a whistle inside and out... as specified, and on time. Either prefabricated by Bundy, or in lightweight, easy-handling lengths ready for fast, economical fabrication by your men. In fabrication, in deliveries, you buy unsurpassed engineering skills and services that mean savings in the long run.

Price-conscious, or performance-conscious—or both—the world's finest automotive engineers know there is no adequate substitute for Bundyweld Tubing.

There can't be. No other tubing is like it.

Contact a Bundyweld Distributor listed below, or write direct to Bundy Tubing Company, Detroit 14, Michigan

# **Bundyweld Tubing**

- DOUBLE-WALLED FROM A SINGLE STRIP



WHY BUNDYWELD IS BETTER TURING



Bundyweld starts as a single strip of basic metal, coated with a bending matel. Then it's



continuously roller twice around laterall into a tube of uni



nace. Bonding meta fuses with basi metal greaters



double-walled an brazed through 366 of wall contect.



NOTE the exclusive patented Bundyweld beveled edges, which afford a smoother joint, absence of bead and less chance for any

rs and Representatives: Combridge 42, Mass. Austin-Hostings Co., Inc., 226 Binney St. 

Chattanace 27, Est. opham-Hickey Co., 3333 W. 47th Place 

Elisabeth, New Jersey: A. B. Murray Co., Inc., Post Office Box 476 

Philadelphia 3, Pess.:

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R. Alloy Metal Soles, Ltd., 18 Feet St., East

Beachweld science 1, 100 April 1,



Cartons...

#### or Carloads



You can depend on us to meet your most exacting requirements for precision enginebearings in small runs or mass-production quantities.

Our special skills and exclusive processes have been developed over the years to meet the challenge of today's shifting demand for automotive and industrial engines.

When you specify our engine-bearings for your production, you are selecting a manufacturer who has been a leader in the field for over 25 years.



DETROIT ALUMINUM & BRASS CORP.

DETROIT 11, MICHIGAN



#### puts you years ahead in pulling power, mileage, economy!

For real performance, insist on this Le Roi highcompression, valve-in-head V-8 engine in your new trucks and busses. It's fast - it's powerful - it's economical - it's compact (overall length only 45"; lowest weight to horsepower ratio in the industry - only 6 lbs. per HP)!

Le Roi's H-540 is built to set the pace for performance in the heavy-duty field:

- \* Box-like crankcase gives extra rigidity.
- \* Short, fully counter-weighted crankshaft reduces vibration, permits smooth, high-speed operation.
- \* Short stroke, light flywheel, and 8-cylinder power impulses assure fast acceleration, quick response.
- ★ Economizer-type carburetion provides fuel economy at road loads - rich mixtures for maximum power and acceleration,
- ★ Wet cylinder sleeves wear well can be replaced at a fraction of the cost of reboring the block,
- \* Maintenance locations are out in open help reduce idle time and shop labor costs,

There are more reasons why it pays to be sure

your new heavy-duty trucks are powered by Le Roi H-540's - many more reasons. Get all the facts-send coupon today for the H-540 catalog.

#### Condensed H-540 Specifications

Number of cylinder	rs						8
Bore and stroke, in	iche	05			41/2	×	41/4
Displacement, cubic	in	ches					540
Horsepower, rated	at	rpm			207	1:	3000
Speed range, rpm					80	0.	3200
Weight bare, lbs.						1	1250

MILWAUKEE 14, WISCONSIN
Plants: Milwaukee • Cleveland • Greenwich, Ohio

Tear out this coupon

and mail today! LE ROI COMPANY, Dept. Al-7 1706 S. 68th Street, Milwaukee 14, Wis.

Position

. State

Send me complete information on the advanced-design features of your new H-540 engine for beavy-duty trucks.

Name

Company.

Company Address.

AUTOMOTIVE INDUSTRIES, July 15, 1952

## Friction material problem? R/M BELONGS IN YOUR PICTURE!

"STOP-AND-GO" IS OUR BUSINESS!

Maybe you don't make over-the-road haulers... but whatever your problems in brakes and clutches, you can count on RAYBESTOS-MANHATTAN for specialized friction materials that will give you the same good results heavy-truckbuilders get from their R/M products.

More cars, trucks and buses now use R/M brake linings, clutch facings, and automatic transmission friction parts than any other make. And R/M's leadership in these products extends to scores of other fields, from farm equipment to musical instruments.

You'll be a step ahead when you

call in your R/M representative. He's ready to help you . . . and he can work from samples, from designs on paper, or from figures on horsepower developed, combined with desired performance characteristics. Behind him stand the facilities of the world's largest producers of friction materials, with six great plants . . . their research departments, and their testing laboratories.

The opening of our new Wabash Division, Crawfordsville, Ind., provides expanded facilities for the manufacture of

SINTERED METAL FRICTION MATERIALS



#### RAYBESTOS-MANHATTAN, INC.

EQUIPMENT SALES DIVISION 445 Lake Shore Drive, Chicago 11, III. Cleveland 14 Los Angeles 11 Detroit 2

Factories: Bridgeport, Conn.

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Canadian Raybestos Co. Ltd., Peterborough, Ont.

RAYBESTOS-MANHATTAN, INC., Manufacturers of Brake Linings . Brake Blocks . Clutch Facings Fan Belts • Radiator Hose • Industrial Rubber Products • Rubber Covered Equipment • Mechanical Packings · Asbestos Textiles · Sintered Metal Products · Abrasive and Diamond Wheels · Bowling Balls



AUTOMOTIVE INDUSTRIES, July 15, 1952

MIL-P-116A, Military Specification for Methods of Preservation dated March 25, 1952, method 1A-2 "Container, Overwrap, Dip-coat Sealed." READ AND SAVE THIS ISSUE FOR FUTURE REFERENCE

## MILITARY PACKAGING SIMPLIFIED 4 of a series



 Parts cleaned and proper preservative applied, ready for greaseproof aluminum foil wrap (JAN-B-148)\*. Note how aluminum foil can be "doughnut" wrapped, thus using less material.

\*Obtain permission for Air Force use



2. Wrapped rings inserted in manufacturer's carton ready for further packaging. This method is very acceptable, especially when correctly fitted cartons or containers are readily available. Secure label to carton.



3. Application of Grade C (JAN-B-121) overwrap. Be sure to use enough material to allow ample overlaps and avoid puncture of material by corners of carton.



 Completed Grade C overwrap. Note the use of the "drugstore" or "locked seam" fold which adds to the waterproofness of this package.



5. Fold all seams and folds of Grade C overwrap down firmly by means of a tool. An adhesive known as Grade C sealer should also be used.

6. Completed package after dipcoating. Be sure to dip from either end and overlap by at least one inch. Affix label to dip-coat and overwrap with kraft or glassine paper to prevent blocking. If kraft is used, attach an additional label.

Note: MIL-P-116A was approved by the Departments of Army, Navy, and Air Force for use of the procurement services of the respective Departments.

#### FOIL PACKAGING FOR CIVILIAN MARKETS

Foil is available again for non-military uses. This should be good news to many manufacturers. Because...industrial spare parts need protection too. And the "eye appeal" of brilliant aluminum foil is an asset to any product. Put foil to work for you as a wrap, a bag, a carton, a container or label. Let aluminum foil do double duty...giving your product "eye appeal" as well as protection... and watch sales grow.





Government-specified methods of foil and laminated-foil packaging demonstrated with actual military products and

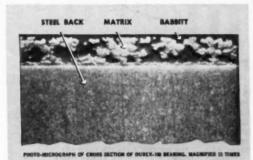
parts. Write for Coach Itinerary! For expert help on any packaging problem, call the nearest Reynolds Sales Office and ask for the "Packaging Man." Or write direct to Reynolds Metals Company,

General Sales Office, Louisville 1, Kentucky.



REYNOLDS ALUMINUM

For Greater Endurance and Longer Life . .



#### THE MATRIX MAKES THE DIFFERENCE

Steel-backed intermediate matrix of porous copper-nickel bonds mechanically and metallurgically with high-lead babbitt overlay to provide far greater embedability.

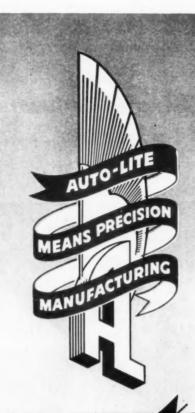
Know how Durex-100 bearings are built, and you know why they last longer in all kinds of service. Durex-100 bearings actually absorb particles of foreign matter . . . protect engine crankshafts to the limit.

In making Durex-100 bearings, the steel back is covered with a layer of metal powders that become a porous matrix integrally brazed to the steel back. A thin overlay of high-lead babbitt penetrates the matrix and bonds mechanically and metallurgically with it. Only Durex-100 bearings provide this protection that assures longer bearing life.

Durex-100 engine bearings are used as original equipment on Cadillac, Buick, Oldsmobile, GMC, and other leading makes of cars and trucks. Ask Moraine for the complete story on Durex-100 bearings. See how they can be used to advantage in the engines you manufacture.

PRODUCTS Engine Bearings by Moraine, NERAL MOTORS DAYTON, OHIO

You're always right with



# **AUTO-LITE**

AUTO-LITE works to serve the nation's needs in peace and in defense. In 28 great Auto-Lite plants from coast to coast, Auto-Lite produces more than 400 products which are original equipment on many makes of America's finest cars, trucks, tractors, airplanes and boats. Their 40-year record of dependable performance is summed up in the phrase, "You're Always Right With Auto-Lite."

THE ELECTRIC AUTO-LITE COMPANY
Telede 1, Ohio Toronte, Ontario

Spark Plugs · Fuel Pumps · Batteries · Bumpers · Generators · Speedometers

Horns · Switches · Moulded Plastics · Speedometer Cable

Starting Motors · Ignition Units · Instruments & Gauges · Windshield Wipers

Lighting Units · Wire & Cable · Gray Iron Castings

Window Lifts · Metal Fabricated Assemblies · Zinc & Aluminum Base Die Castings

WALKER BROTHERS, of CONSHOHOCKEN, FA., have earned their reputation as manufacturers of quality conduit and electrical raceway tubing through years of serving the electrical industry. To mainrain this position, it requires constant and rigid inspection—an alertness to new methods and the

McKAY is proud to have had their tube mills selected by WALKER. Experience gained after

use of quality equipment.

producing millions at feet of conduit on McKay tube mills, has proven conclusively that they can rely on McKay equipment to maintain their high standard of quality and teep pace with the ever increasing volume demanded by industry.

If your product is tubing it will pay you to investigate McKay equipment for greater yield—higher quality product — lower maintenance — and less

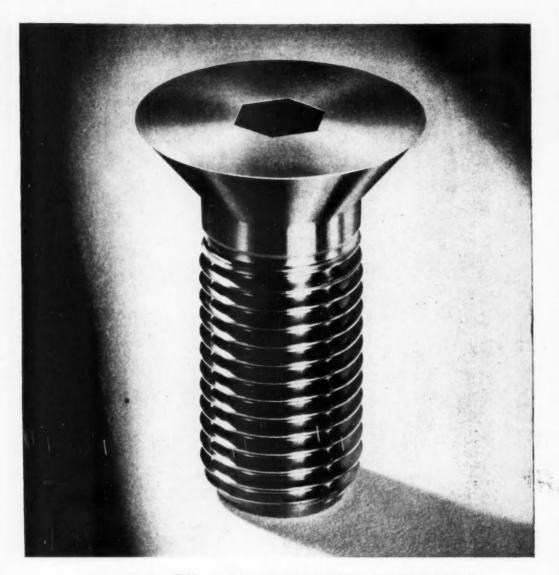
The MCKAY MACHINE Company ric wold roundstown, OHIO ASSOCI

ASSOCIATED WITH WEAN ENGINEERING CO., INC.

FABRICATING AND STEEL INDUSTRIES

ENGINEERS AND DESIGNERS OF EQUIPMENT FOR THE AUTOMOTIVE,

The McKay RS-525-150 KVA Electric Weld
Tube Mill with McKay Rotary Saw Cutoff



## For assembling THIN-SECTION MATERIALS UNBRAKO FLAT HEAD SOCKET CAP SCREWS

Precision made to Class 3 fit, these Unbrako screws have maximum head contact, flush surface assembly, non-slip internal wrenching, high shear and tensile strength. Write for descriptive literature. Standard Pressed Steel Co., Jenkintown 53, Pennsylvania.

Standard sizes, #4 to  $\S_4''$  inclusive, are available from your UNBRAKO distributor's stocks. Ask him about deliveries, you'll like what you hear.



UNBRAKO SOCKET SCREW DIVISION CAP SCREWS - SET SCREWS - SHOULDER SCREWS - DOWEL PINS - PRESSURE PLUGS

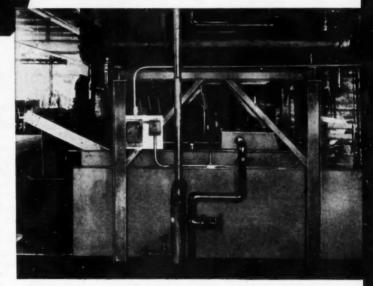
# Quenching Oil

... AT Chain Belt OF MILWAUKEE

★ In the plant at Chain Belt Company, in order to obtain better control of the quench oil properties, a Delpark Filter has been installed to eliminate the breakdown products of the quench oil in addition to the scale and carbon soot carried in the oil by their heat treating operations. It has been found that this filtering unit is definitely removing these foreign matters, thus enabling them to maintain more uniform viscosity and lowering their maintenance costs. This lower cost is brought about by the fact that there is less accumulation of foreign matters in their heat exchangers and settling tanks.

With approximately 12,000 gallons of oil in the entire system, the Delpark Industrial Filter, by pumping 50 gallons per minute, assures a complete change of oil once every four hours. In the span of an 8-hour day, 24,000 gallons of oil are filtered at an approximate cost of \$1.20 per day for filter media.

There's a Delpark Industrial Filter to fit your requirements. Let a Delpark Industrial Filtering Specialist show you the facts on the finest in Industrial filtration. Write for more complete information.



PATENTS

# Delpark

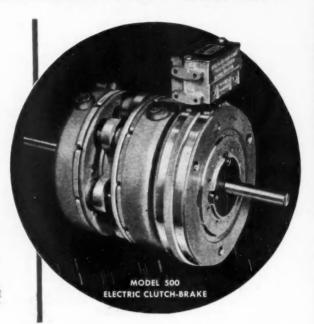
INDUSTRIAL FILTRATION

Backed by 30 Years Experience in Industrial Filtration

# Warner Electric Clutch-Brakes provide split-second, intermittent cycling of Hautau-Turndex automation machines

# WARNER electric motion control

- accelerates and decelerates master cam in less than 1/10 second
- provides shock-free movement—no abrupt starting, stopping or catapulting action
- permits automatic or manual control of index cycle
- accurately positions cams for constantly precise table indexing



DEVELOPING machines for tomorrow's "automatic factories," design engineers are finding Warner Electric Clutches and Brakes offer new, important design opportunities because of the ease and efficiency with which they control power transmission by remote, mechanical, hydraulic, electric or electronic means. A good example is this engine-block transfer machine that "automates" a right angle, 180° tip-over production line. Compound motion is provided by a packaged, cam-actuated indexing table. The model 500 Warner Clutch Brake provides split-second, intermittent cycle control of the master cam, automatic or manual control of the

index cycle. It locates the cam with unvarying precision for each index—accelerates and decelerates it in less than one-tenth of a second. There is no abrupt starting, stopping or catapulting action. Result is a combination of accuracy, speed, smoothness, power and versatility never before achieved. Maximum engine block production is obtained by complete mechanical handling cycle of only 1½ seconds!

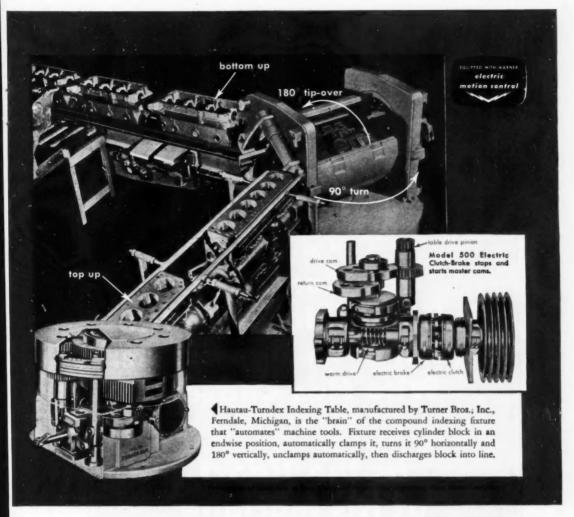
If you have a clutching, braking, tensioning, indexing or speed control problem, investigate the new, automatic features and advantages of Warner electric motion control!



#### **ELECTRIC BRAKES & CLUTCHES**

FOR INDUSTRIAL APPLICATIONS

1 14 M .. 14 17 1



Warner Electric Brakes, Clutches and Clutch-Brakes give you new, unique simplicity of design and operation. There are only two main parts, an armature and magnet. Operation is by electro-magnetic, instantaneous engagement and release of friction surfaces. Torque tatings are extremely high for small size and light weight. No coasting or slipping when "locked in." Easily designed into original equipment. Readily adapted to automatic cycles and remote control by limit switches, relays, electric-eyes, pushbuttons, etc.

Rate of application accurately controlled to synchronize motions—give exact degree of speed and power required.

COMPLETE ENGINEERING SERVICE : : : Warner offers complete application and design engineering service and field assistance. If you have a clutching, braking, tensioning, indexing or speed control problem, consult competent, experienced Warner brake and clutch specialists for reliable recommendations on torque, heat, electrical controls, capacity, etc.

2 3. FRED DERIO	Warner Electric Brake & Clutch	Warner Electric Brake & Clutch Co., Dept. Al, Belait, Wis.  ☐ Please send your FREE Bulletin No. 703-A.					
a Cara do	Have your representati	Have your representative call to discuss my problem:					
ALL DESTRUCTIONS	Firm Hame	Firm Name.					
A STATE OF THE STA	Individual	Title					
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1902 • 1952

## YEARS

**OUALITY LEADERSHIP** 



You Can Place **Full Confidence in the** Product of the Manufacturer **Who Has Chosen** 

> as the Heart of His Machine



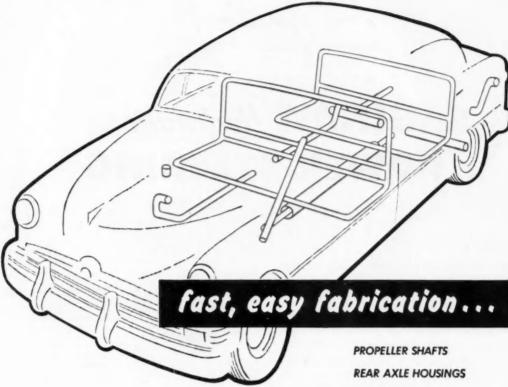
#### PARTS AND SERVICE EVERYWHERE

TODAY'S BROAD AND DIVERSIFIED LINE OF CONTINENTAL RED SEAL ENGINES INCLUDES SOME 80 BASIC MODELS, BUILT TO MORE THAN 2,000 DIFFERENT SPECIFICATIONS FOR COUNTLESS APPLICATIONS ON LAND. AT SEA AND IN THE AIR.

Continental Motors Corporation

MUSKEGON, MICHIGAN

## Brainard TUBING



BRAINARD Electric-welded Tubing is a uniform product designed to simplify fabrication . . . it can be beaded, expanded, swaged, spun, flanged, upset, grooved, fluted, flattened, tapered, and otherwise formed. It has good machining qualities, and finish can be supplied as specified. Supplied straight or fabricated, sizes ½" to 4" O.D.; .025 to .180 gage.

Brainard's integrated production facilities assure quality control throughout manufacture . . . from ore to finished tubing. For a dependable source of automotive tubing look to Brainard.

For catalog or further information write Brainard Steel Division, Sharon Steel Corporation, Dept. W-7, Griswold Street, Warren, Ohio. Offices: Atlanta, Baltimore, Buffalo, Chicago, Cincinnati, Cleveland, Columbus, Davenport, Des Moines, Detroit, Grand Rapids, Indianapolis, Milwaukee, Nashua, New York, Philadelphia, Pittsburgh, Rochester, San Francisco, Syracuse, Toledo.

PROPELLER SHAFTS

REAR AXLE HOUSINGS

TAIL PIPES

EXHAUST TUBES

GAS TANK FILLER TUBES

AIR CLEANER TUBES

TUBULAR SEAT FRAMES

STEERING COLUMNS

TORQUE TUBES



WARREN, OHIO

Proved and approved for over 13 years

# SAGINAW Hydraulic POWER STEERING

#### \*Now available on 1952 model Oldsmobiles, Buicks and Cadillacs

Since 1939, when it was introduced, Saginaw hydraulic power steering has proved its worth over and over again on thousands of commercial vehicles.

Now Saginaw bydraulic power steering is available on passenger cars! And already it has won wide acceptance, for "there is no steering like power steering . . . and no power steering like Saginaw bydraulic power steering."

This new application of the Saginaw hydraulic power steering principle is amazingly simple in design... has fewer moving parts, fewer parts in all. It retains the natural feel of ordinary steering at moderate speeds, but makes a spectacular reduction in steering effort at low speeds or for parking.

For further information, write Saginaw Steering Gear Division of General Motors.

IF IT'S EASY TO STEER . . . IT'S A SAGINAW GEAR



General Matars Corporation, Saginaw, Michigan



#### RECIRCULATING BALL PRINCIPLE

Saginaw's famous recirculating ball principle provides friction-free operation that is unique in the industry. It is a principle proved in over a million automotive steering gears.



#### HYDRAULIC POWER STEERING

A hydraulic booster multiplies driver steering effort, makes it easy to swing the wheel of the biggest car traveling at any speed—or even when standing still.

\*Optional equipment at extra cost

SSG PRODUCTS

STEERING GEAR ASSEMBLIES •
STEERING LINKAGE ASSEMBLIES
• PROPELLER SHAFTS • DIESEL
ENGINE AND AIRCRAFT PARTS



Elwood Haynes and his first gasoline automobile in the 1890's. Advances in design, construction and performance in automobiles have been paralleled by comparable advances in Morse Timing Chain Drives.

This is one of a series of old prints of early automobiles that will appear in future Morse advertisements. Write for your free, enlarged copy, suitable for framing for your collection. **OUESTION:** 

Why do 70% of today's timing-drive-equipped cars use Morse Timing Chain Drives as original equipment?

ANSWER:

They're the most economical, trouble-free timing chain drives made. They're backed by 40 years of engineering specialization and design service, which is always at your call in time of need.

NO QUESTION: There is no question that Morse is the leading producer of timing chain drives, M=TC, Morse means Timing



Morse means Timing Chains

### Are you getting maximum returns from your carbide-tool investment?

You are if your cemented carbide tools pay off with top production at top tool speeds . . .

if top tool life is combined with top adherence to tolerances . . .

if top production per tool is coupled with minimum rejects . . .

and if your investment in carbide tools is limited to universal-use standards, permitting a low inventory of special multiple-point tools.

In short, you are getting maximum returns if you use Carbolov Cemented Carbide tools, for Carboloy quality and service are designed to deliver all carbide benefits, to give you maximum returns from each dollar invested in cemented carbide tools.

Scan the Carboloy products briefly described on these pages. Then shoot the coupon at the right back to us for your free copy of the complete Carboloy General Tool Catalog.

And for your immediate carbide-tool needs, why not telephone your Carboloy Distributor right away?

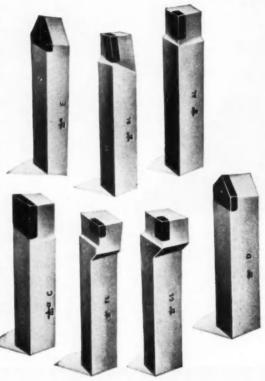
Stocks now at your Carboloy Distributor's ready for immediate delivery - will satisfy your every need in Standard Carbolov Tools and Blanks, and most special tools equipped with Carboloy Cemented Carbides. Call your local Carboloy Distributor now.

11151 E. 8 Mile Road, Detroit 32, Michigan

PLANTS AT DETROIT, MICHIGAN; EDMORE, MICHIGAN; AND SCHENECTADY, NEW YORK



Carbolay Permanent-Magnet Sheet-Steel Separators prevent feeding of doubles. Use permanent magnets to give an extra "hand" in your shop work. Great for magnetic stands, tool-holding devices, sweepers' up" tools, magnetic paper grippers on ma-chines, containers for small parts, and magnetic retrievers. Write for FREE Carboloy Permanent Magnet Stock Catalog, PM-100. (Use handy coupon at right.)

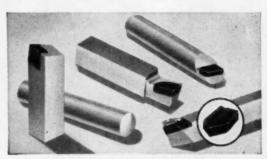


#### 11 STANDARD CARBOLOY TOOLS Perform 80% of Your Machining!

Chop your costly special carbide-tool inventories with Standard Carboloy Tools. Only 11 styles (right-hand tools not illustrated) do up to 80% of all your singlepoint tool machining. Whatever the job, odds are versatile Standard Carboloy Tools will do it. What's more, they'll outproduce and outlast high-speed steel tools by as much as 10 to 1! At the same time, they'll pile up savings in machine-tool maintenance, downtime and replacement. You can count on Standard Carboloy Tools, whether used "as is" or quickly and economically specially ground in your own toolroom, to do a wide variety of jobs faster, better, for less. (See pages 14-19, 20-27 in your Carboloy General Tool Catalog, GT-250.)



STANDARD CARBOLOY BLANKS are mass-produced, available in many styles and hundreds of sizes at extremely low prices. They are designed for broad use in most of your machining needs. Brazing Carboloy Blanks to tool shanks will handle your emergency jobs readily; no time lost on special tooling. (See pages 20-22, 32-42 of your Carboloy General Tool Catalog, GT-250.)



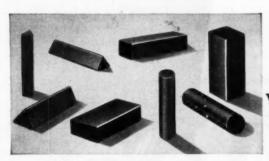
OTHER CARBOLOY STANDARD TOOLS in a wide selection that includes: roller turner tools, blanks for clamped-on-type tools, boring tools, and solid Carboloy cylinders that can be adapted to many special shapes in solid boring tools. All items are in stock; semi-finish, or finish-ground, ready for use. Tools that will save plenty in production. (See pages 22-28 of your Carboloy General Tool Catalog.)



SPECIAL CARBOLOY BLANKS can be furnished in any size, shape and grade of cemented carbide to meet your exact, individual requirements. In addition to general types of special shapes, flatformed blanks with complicated shapes and a large selection of semistandard and modified blanks can be made, ground or unground. (See pages 43-44 of your Carboloy General Tool Catalog, GT-250.)



SPECIAL TOOLS EQUIPPED WITH CARBOLOY CEMENTED CARBIDE. Carboloy Cemented Carbide is furnished to more than 250 leading tool manufacturers for use in special tools, many of which are stocked by Carboloy Distributors. Also, when requested, Carboloy engineers work with the tool maker to help his customer (you) solve special problems. (See pages 28-29 of Catalog, GT-250.)



CARBOLOY INSERT BLANKS are available in stock in round, triangular, square and rectangular styles in a wide variety of sizes; they are finish-ground, ready for use in your mechanical-type holders. Inserts are quickly resharpened by off-hand grinding and have several cutting edges, depending upon shape of insert. For example, ½" square insert has eight cutting edges, four on either side. (See pages 20-22 of your Carboloy General Tool Catalog, GT-250.)



Please send me, without cost or obligation:

Carboloy General Tool Catalog, GT-250

Carboloy Permanent Magnet Catalog, PM

## Complete Carboloy FREE

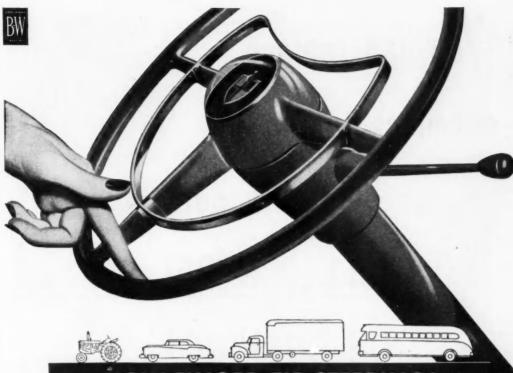
It's a fact-packed 60 pages. Hundreds of illustrations showing typical uses, specifications. Also, conversion tables for cutting steels, ferrous, nonferrous and nonmetallic materials. Lists other free Carboloy Services, technical literature. Send coupon below today!

#### CARBOLOY DEPARTMENT OF GENERAL ELECTRIC COMPANY

11151 E. 8 Mile Road, Detroit 32, Michigan

Company





#### NOW FINGER-TIP STEERING!

#### ... with PESCO HYDRAULIC PUMPS

Right now, many Americans are enjoying the thrill of hydraulic power steering for the first time. Complete and absolute control of the vehicle is obtained at all times . . . perfect safety, even on soft shoulders or in case of a blowout. Now, just the touch of a finger to the wheel, at any speed, and the vehicle responds surely and easily.

Less driver fatigue and increased pay loads for truckers are just two of the many benefits of hydraulic power steering.

Pesco engineers have worked hand in hand with automotive engineers in the development of a pump for this unit, which is one more in a long series of important developments in the field of pressurized power and controlled flow.

Investigate the advantages of hydraulic power steering for the vehicles you manufacture. Perhaps Pesco's experience can be helpful to you. Why not call us?



New Pesco Hydraulic Power Steering unit for passenger cars consists of pump and reservoir.



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BORG - WARNER CORPORATION

You can replace seamless tubing or pipe with our



ROLLED STEEL SPACER

TUBES OR BUSHINGS



and



save money in

machining · material · labor



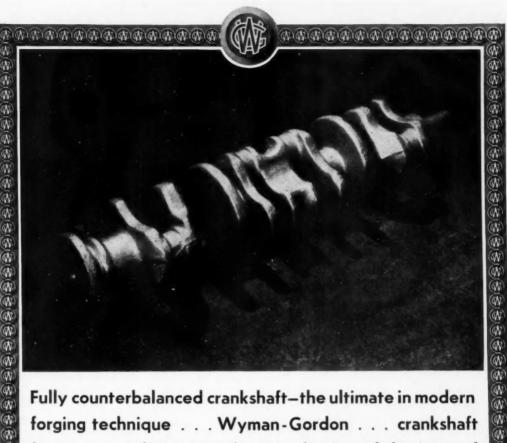
EDERAL-MOGI



Since 1899

sizes; cost bronze bushings; rolled split-type bushings; bimetallic rolled bushings; washers; spacer tubes; precision bronze parts and bronze bars.

FEDERAL-MOGUL CORPORATION - 11037 SHOEMAKER DETROIT 13, MICHIGAN



Fully counterbalanced crankshaft—the ultimate in modern forging technique . . . Wyman-Gordon . . . crankshaft forging specialists since the introduction of the internal combustion engine . . . first to forge crankshafts with integrally forged counterweights

Standard of the Industry for More Than Sixty-Five Years

## WYMAN-GORDO

FORGINGS OF ALUMINUM . MAGNESIUM . STEEL WORCESTER. MASSACHUSETTS HARVEY, ILLINOIS DETROIT. MICHIGAN

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# For The Third Consecutive Year HOLLEY EQUIPPED CAR Wins Mobilgas Economy Run

#### 1952 Grand Champion Winner Equipped with Holley Centri-Flo Carburetor

Economy engineered Holley carburetors and pressure
distributors have been original equipment on
the Grand Champion winners of the Mobilgas
Economy Run for three straight years.
In addition, the Holley record includes
seven class winners over the same period.
No other manufacturer of fuel and ignition
equipment can match this economy record!

FOR MORE THAN
HALF A CENTURY—
ORIGINAL EQUIPMENT
MANUFACTURERS FOR THE
AUTOMOTIVE INDUSTRY



ECONOMY-ENGINEERED HOLLEY PRODUCTS



HOLLEY CENTRI-FLO



HOLLEY VISI-FLO



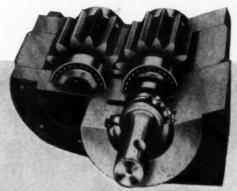
AA-1 CARBURETOR



PRESSURE DISTRIBUTOR

RT-15 and I-15

# "Lean Carilloy alloy steel is saving us \$40 a ton with no loss in performance."



20 THESE ROTARY PUMPS made by Commercial Shearing & Stamping Co., oil is trapped between the teeth of two meshing gears. Speeds are exceptionally high, and the gears must be tough and durable. Lean Carilloy alloy steel meets service requirements and lowers costs.

Commercial Shearing & Stamping Co., of Youngstown, Ohio, is another manufacturer who, unable to obtain rich alloy steel, is now using lean alloy steel for heavy-duty parts that must operate in extremely tough service. Here is their experience, as told by Mr. T. C. Kane, Chief Engineer:

"We used to make the gears for our heavy-duty gear-type hydraulic pumps out of a rich alloy steel, Carilloy 4615 (1.65-2.00% nickel). But when nickel started getting scarce we had to find a steel in better supply that would stand up in really hard service.

"Our pumps operate at pressures as high as 1,500 psi and at speeds up to 2,000 rpm. Gear wear of only 0.005 inch causes a substantial drop in pump efficiency; so we need a tough, wear resistant steel for the gears. The question was, could we get the necessary properties in a lean alloy steel?

"U.S.S Service Metallurgists helped us out. They recommended Carilloy 5120, a straight-chrome alloy. We are frankly surprised at the excellent results we're getting with this steel. Not only do the gears meet all of our high performance standards but this lean alloy steel is easier to machine and heat treat. And we pay a lower grade extra on it. All told, the change to lean alloy steel saves us \$40 on every ton of steel we buy."

—T. C. Kane, Chief Engineer,

Commercial Shearing & Stamping Co.

THE GEARS are machined directly from round bar stock



The switch from rich to lean alloys is not always as easy as it was at Commercial Shearing & Stamping Co. You may require special heat treating, or simply more careful heat treating, to obtain desired mechanical properties. But whatever your steel problems, our metallurgists will be glad to help you with them. Just call our nearest District Sales Office, or write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

UNITED STATES STEEL COMPANY, PITTSBURGH . COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. . UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

## U·S·S Carilloy Steels



2-1437

ELECTRIC FURNACE OR OPEN HEARTH COMPLETE PRODUCTION

PACILITIES IN CHICAGO OR PITTSBURGH

II NITED STATES STEEL

# The trend is to more stampings with BLISS Presses



In molding turbine blades from iron powder, Thompson Products credits the process and Bliss presses with the ability to hold tolerances to 0.003 in. on airfoil contour.

#### 8 Bliss Hydraulic Presses form iron powder into complex turbine blades

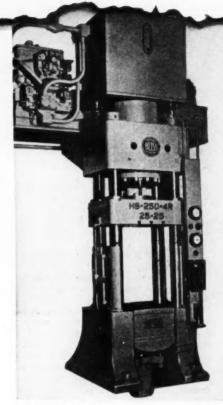
These special Bliss hydraulic presses mold, coin, and straighten aircraft turbine blades at Thompson Products, Inc. Production of these critically-needed turbine blades is accelerated because machining requirements are minimized. And since there's no waste, materials are conserved. The 8 Bliss presses were specially-engineered for the job: their tool steel dies deliver up to 250,000 parts—all formed to exacting tolerances. Bliss has pioneered in presses like these. If you have a powder forming problem, call on Bliss experience—it's the logical thing to do.

E. W. BLISS COMPANY, CANTON, OHIO E. W. Bliss (England) Ltd., Derby, England

E. W. Bliss Company (Paris), St. Ouen sur Seine, France

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

Branch affices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Taronto, Canada, West Coast Representatives: Macre Machinery Ca., Las Angeles and Son Francisco, Star Machinery Ca., Las Angeles and Son Francisco, Star Machinery Ca., Ceattle. Other dealers in United States cities and throughout the world.



Features of Bliss hydraulic presses include dual flow pumps, rapid advance and return speeds, variable pressing speeds, automatic reversal, automatic speed change, numerous safety devices and construction refinements.

Biss on your press is more than a name ... it's a guarantee!



Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Las Angeles and Riverside, Calif.; New Bedford, Mats.; Rome, N. Y.— SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY



## How to make a quiet engine quieter

L·O·F Fiber·Glass Hoodliners muffle engine sounds on cars and trucks

Advances in automotive engineering make car engines quieter each year. But even the soft purr of a new engine can be hushed with the simple installation of Fiber Glass insulating blankets under the hood.

Excellent sound absorption of Fiber Glass substantially reduces air-borne noise in cars and trucks. And the L·O·F Hoodliner can be easily installed on the assembly line. Look into the ways you can use it on your cars and trucks

to help make engines quieter, more efficient.

Fiber Glass is superior insulation for tops, on fire walls, under package trays and as dashliners. And L·O·F delivers Fiber Glass right on schedule, just as it has delivered quality glass products to the industry for years.

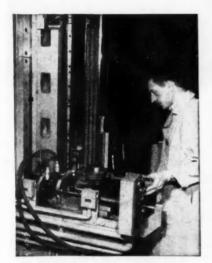
For more information, call L·O·F's Detroit office, 610 Fisher Building, Trinity 5-0080, or write, wire or phone Libbey Owens Ford, Dept. F·G 772, Nicholas Building, Toledo 3, Ohio.



LIBBEY-OWENS-FORD GLASS COMPANY
FIBER-GLASS DIVISION

FIBER · GLASS





## broached in a single pass ... the AMERICAN way

Combining two operations on an American SB 48-15 Single Ram Vertical Hydraulic Surface Broaching Machine enabled this automotive engine manufacturer to broach the radius and pad (which are non-adjacent) of the front engine cover in one pass.

The tooling for this operation consists of generating type broaches and shaving blades mounted on the main machine slide for broaching the radius and joint surfaces. In addition, a special hardened and ground guide is mounted on the table to guide generating type broaches and shaving blades which are pulled down by adapting the lower end of the holder to the machine slide. These broach the pad thus completing the two operations in one pass.

Automatic clamping, plus an automatic sliding table are two additional features of this American installation that help maintain a production rate of approximately 115 parts per hour at 85% efficiency.

Write for your copy of American's Circular 300.



#### YOU CAN SOLVE YOUR BROACHING PROBLEMS THE AMERICAN WAY

This is only one of thousands of problems solved during American's 25 years of experience in the manufacture of broaching machines, broaches, and broaching fixtures. A part-print or sample and hourly requirements are all it takes to start American engineers working on your problem. Write today!

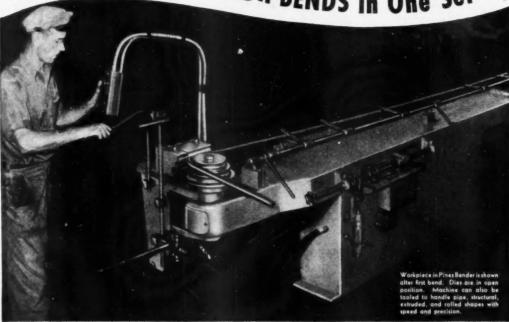


ANN ARBOR, MICHIGAN

See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



Forming MULTIPLE RADII BENDS in One Set-Up



## HOW A PINES AUTOMATIC BENDER Speeds Production at Randall Company

The Pines Automatic Bender set-up illustrated here is one employed by The Randall Co. of Wilmington, Ohio, to speed production of truck seat frames requiring six bends of three different radii. The machine and tooling, designed and built by Pines, forms the complete frames on one machine. Operations are performed in sequence with a triple die set-up. Tool changes are eliminated, and daily production maintained at an average rate of 240 bends per hour. Machine is push-button controlled and hydraulically operated — is adaptable to a wide range of production bending jobs, handles serpentine, coil, compound, and multiple bends without marking or distorting. Complete range of sizes for light or heavy work are available.



When you have a production bending problem, call on Pines Engineers for assistance. Chances are they can also help you save time and cut costs.

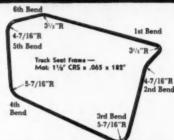
#### FREE DATA SHEETS

Write today for free copies of "Pines News" illustrating and describing bending and tooling techniques on actual jobs.



Specialists in Tube Fabricating Machinery

BENDING . DEBURRING . CHAMFERING . THREADING MACHINERY





Close-up of pressure and clamping die in open position ofter completing fourth bend. For each radius operator simply positions stock in proper grooves of triple die. Planes of bends are determined by floor mounted gauges

653 WALNUT . AURORA, ILLINOIS



THE great superliner "UNITED STATES", new and majestic queen of the United States Lines, carries on a great tradition of American shipbuilding, a tradition that reaches back across the years to that other "United States", Commodore Stephen Decatur's sturdy little frigate, which defeated the British "Macedonian" in the War of 1812.

Shipbuilding, like most other industries, has changed greatly in the past 140 years, yet in one respect, the two "United States" are akin—

they both rely on anchor chains to keep them on their moorings.

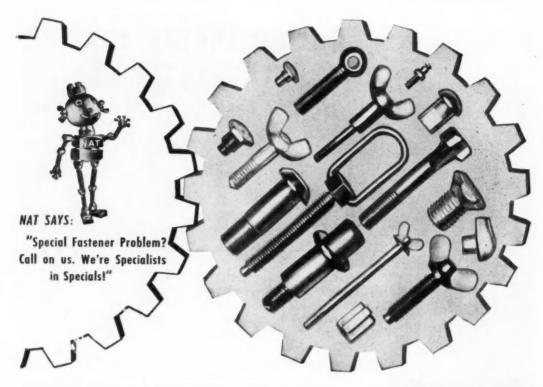
But the anchor chain of the modern "United States" has a virtue unknown to the early bluejackets. Each link is drop-forged—under Chambersburg Hammers—a process that gives enormous strength, together with toughness and ductility to absorb the tremendous strains and shocks to which anchor chains are subjected.

For impact forging gives maximum tensile and torsional strength, with concentration of grain structure at points of greatest shock and strain, and high resistance to fatigue.

There is no substitute for "impact" forging, CHAMBERSBURG ENGINEERING CO. Chambersburg, Penna.

The anchor chain of the S.S. "United States" was made by the Baldt Anchor Chain and Forge Division of the Boston Metals Co., by the "Di-Lok" method—the only chain making process that can be called 100% forged. Chambershurg Steam Drop Hammers are used to forge the male link of the chain. The female link is then drop-forged around the servated stems of the male link, each link being "laced" through the last link made and forged under the hammer, until a full 15 fathom (90 foot) length is completed.

# CHAMBERSBURG



## NAT's really geared for your "Specials"

When you need special fasteners or small parts in volume, National's "Special Products Service" can save you time, headaches and money. We've done it for hundreds and hundreds of customers, and we can probably do it for you—tell you how your part can be adapted to our methods of production, and produce it for you in the volume you need, economically and speedily.

With some 3500 producing units, from cold-heading equipment to many types for secondary operation, we offer you facilities second to none for efficient and expert handling of your "Special" requirements. Send us your specifications or call your nearest National representative.

Remember NAT, too, when you need standard fasteners or specialties like lock nuts or self-locking bolts and screws. National produces the most complete line of fasteners for industry made by any one manufacturer in the U. S. A.

Representatives in Chicago, Cincinnati, Detroit, New York, Philadelphia, Kansas City, San Francisco and Seattle—write or call direct to:

### THE NATIONAL SCREW & MFG. COMPANY Cleveland 4, Ohio

Pacific Coast: National Screw & Mfg. Co. of Cal. 3423 South Garfield Ave., Los Angeles 22, Cal.



EASTENIEDS



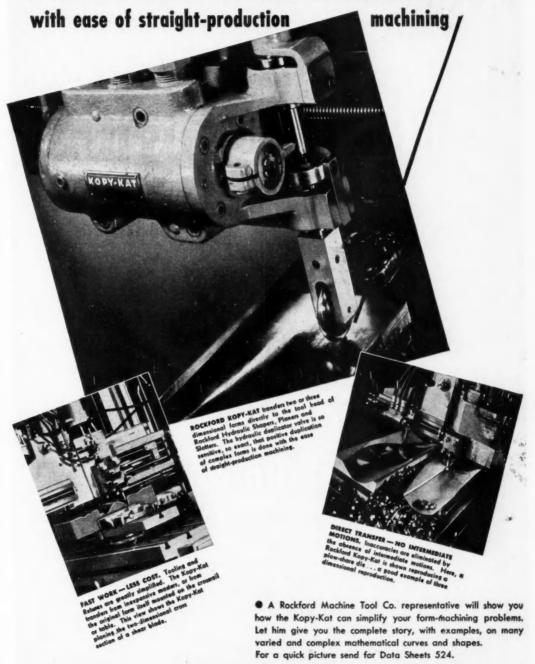
HODELL CHAINS



CHESTER HOISTS



# DUPLICATES FORMS DIRECTLY!





SOO KISHWAUKEE STREET PROCKFORD, ILLINOIS

# Quantity PRODUCTION

GREY IRON CASTINGS

ONE OF THE NATION'S LARGEST AND MOST MODERN PRODUCTION FOUNDRIES

ESTABLISHED 1866

THE WHELAND COMPANY

FOUNDRY DIVISION

MAIN OFFICE AND MANUFACTURING PLANTS

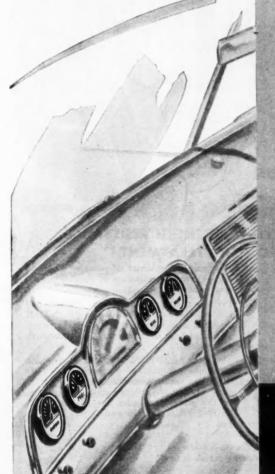
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\*



### DASHBOARD INSTRUMENTS

Manufactured Under Rigid Quality Control



Oil Pressure Telegage
Water Temperature Telegage
Fuel Level Telegage
Ammeter

Scientific Quality Control governs all manufacturing and assembly operations involved in the production of K 5 dashboard instruments and instrument clusters for passenger cars and trucks.

As a result these instruments are dimensionally accurate, easy to install; they function uniformly and assure the ultimate user years of uninterrupted service.

King-Seeley engineers are always at your service.

# KING-SEELEY CORPORATION

ANN ARBOR, MICHIGAN

PLANTS IN

ANN ARBOR SCIO

YPSILANTI



# . it's a combination of HIGH YIELD STRENGTH RESISTANCE TO SHOCK and REQUIRES NO HEAT TREATMENT!"

- Jim: Say, that sounds like an alloy that ought to do the trick. The production jobs we've got require lapping and close tolerance machining operations.
- J.D.: FRONTIER 40-E will do just that! There's no tearing effect of cutting tools and we can be sure of getting a smoothly finished surface.
- Jim: I know it can be readily reamed or tapped. But what about pressure tightness and corrosion resistance?
- J.D.: Castings of ½" to 1" wall thicknesses withstood pressures up to 400 pounds per square
- WRITE for your copy of the FREE ALLOY DATA book that will give you the full story on how 40-E can work with profit for you.

- inch with no evidence of porosity or cracking. Corrosion resistance is excellent, even under stress.
- Jim: I've seen truck axles, stress parts in planes and lots of other applications where FRONTIER 40-E was used with substantial weight reductions...and yet all-important product strength was increased.
- J. D.: You can't beat FRONTIER 40-E castings for the important physical properties needed in applications throughout every industry. Better get on the phone and order our FRONTIER 40-E right away,

Remember — if aluminum can do it better — FRONTIER 40-E Aluminum Alloy can do it best!



# FRONTIER BRONZE CORPORATION

4885 PACKARD ROAD, NIAGARA FALLS, NEW YORK



TEST PUMPING

### tells an interesting story



A A The outstanding features of Layne constructed wells and pumps are pictured and described in a catalog entitled "Layne Well Water Systems." A copy will be sent on request. "Test Pumping"—is the trial run, shake-down cruise—or field maneuver of every well constructed by Layne. It is these tests that show what skill and experience have accomplished.

But long before the test pumping can be made, Layne has had to do a lot of planning, plotting and figuring out of such things as; kind of sand screen, size of drive shaft, type of bearings, number of pump stages and how much horsepower the motors should have to produce a promised amount of water against a certain pressure.

Once all of the above answers are on paper, they must be transmitted into an underground construction project—a task that requires more than ordinary skill and ability.

But wherever water is needed in quantity and at low cost, you may be sure that units installed by Layne will have unmatched efficiency, operate with utmost smoothness, be ever dependable and capable of lasting many, many years.

For further information on any phase of water development, address

LAYNE & BOWLER, INC. General Offices, Memphis 8, Tenn.

WATER WELLS
VERTICAL TURBINE PUMPS
WATER TREATMENT

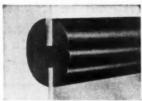


### All splash and no leak!

Even a small stream of water makes quite a splash when it hits glass. It gives you some idea of what happens when the myriad drops of a rain-storm hit a windshield or fixed window. That's where there should be Inland Self-Sealing Weather Strip. It's specially compounded rubber, permanently compressed by its own resilience. It's weather-tight and rattle-free!

You can slash vehicle-production cost with Inland Strip, because installation is a fast, one-man job. And glass replacement costs the user less for the same reason. Design your vehicles for Inland Self-Sealing Weather Strip.

INLAND MANUFACTURING DIVISION
General Motors Corporation • Dayton, Ohio



1. Cross-section of Inland Weather Strip.



3. Slip the glass into the Inland Strip.



2. Set the Inland Strip in the body panel.



4. Zip the filler strip into the channel.



Self-Sealing Weather Strip

# WHERE WEIGHT COUNTS



# GUNITE WHEELS

### DESIGN TELLS THE STORY

Gunite truck and trailer wheels are skillfully engineered to stand the gaff of "peak-load" operation. Tubular spoke design provides maximum strength through accurate weight distribution.

Six low-torque floating rim bolts assure easy-servicing and true alignment with rim clamp. Made of fine-quality cast steel, Gunite tubular-spoke wheels are rugged...yet, save vital pounds... assure minimum unsprung weight... cut costs per every mile of operation. Best of all, you can specify Gunite lightweight cast-steel wheels at no premium in price.



GUNITE FOUNDRIES CORPORATION

Rockford, Illinois



# PRECISION PRODUCED TO EVERY AIRCRAFT AND ARMED FORCES SPECIFICATION

You name it . . . Garrett makes it! Garrett manufactures the most complete line of washers in the world. Whatever you need to meet Armed Forces or aircraft specifications. Some of them are:

AN 935	AN 961	NAS 70
AN 940	AN 970	NAS 143
AN 945	AN 975	NAS 143C
AN 950	AN 8013	NAS 463
AN 955	AN 122576 thru	A-3135 (countersunk)
AN 960	122600	A-3235 (countersunk)

IMMEDIATE DELIVERY FROM STOCK OF ALL ABOVE ITEMS

Garrett's complete manufacturing facilities and large inventories of all types of washers—lock and flat—make possible quick deliveries of regular steel, brass, bronze, monel metal, aluminum, Alclad and copper as specified. Garrett's plating facilities can supply them plated with zinc, nickel, brass, chrome or parkerized.

For all types of small metal stampings, lock washers, flat washers, hose clamps or springs Garrett as a manufacturer offers you one source, one high quality and one place to rely on quick deliveries.

Whether standard parts or the latest specifica-

the latest specifications, call Garrett. Write for latest folder.

GEORGE K. GARRETT CO., INC.
D & TIOGA STS. PHILA. 34, PA.

OF PENNSYL



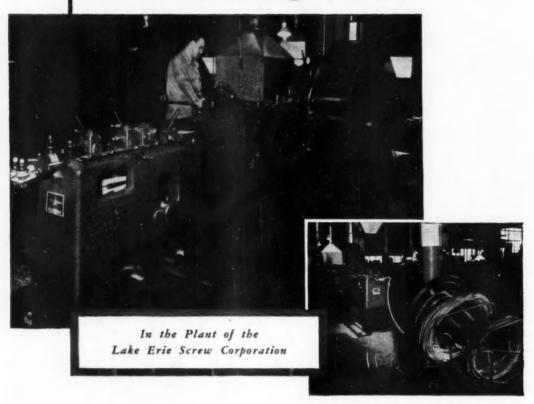






RB&W 107 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG

# Wire Drawers Make Bolt Heading Easier



Ajax-Hogue Wire Drawers coupled with bolt headers improve the rate and quality of production while at the same time they effect other substantial savings.

The exactness of size, straightness and easier workability of clean, freshly drawn, freshly coated wire are factors which lessen the down time and greatly extend the life of the header die. These savings plus the additional saving in cost between hot rolled rod and more expensive mill drawn wire are achieved by many bolt manufacturers throughout the country by using Ajax-Hogue Drawers.

Write for Bulletin No. 111 for more complete information.



# Unnouncing Nationwide MAGNAFLUX

### **Commercial Inspection** Service



Low-cost parts inspection for smaller plantsfleet overhaul-specified inspection

For plant and field inspection of large equipment anywhere

### MAGNAFLUX Laboratory Inspection

Serves as your inspection department to whatever extent you require or desire, at any stage of processing or production. Available through 11 Magnaflux Corp. Laboratories.



MAGNAFLUX Field Inspection

Prevents unpredicted failure in critical production, construction and erection equipment by timely detection of faulty welds, fatigue cracks, fractures, etc. Ready to serve you in your plant or in the field anywhere in the United States.

THIS MAGNAFLUX-OWNED and OPERATED SERVICE offers you full facilities for non-destructive testing and inspection, where limited use or special requirements make investment in inspection equipment impractical.

It makes available to you all the inspection methods of Magnaflux Corporation: MAGNAFLUX. MAGNAGLO, ZYGLO-the "big 3" used by more industries, for more inspection operations than all other methods combined - as well as STATIFLUX, PARTEK, SONIZON and STRESSCOAT. One or another of these methods may be applied to magnetic or non-magnetic metals, glass, ceramics and other materials.

Magnaflux Commercial Inspection includes both Laboratory Inspection of parts-from one to 1,000,000and Field Inspection of machinery and equipment anywhere.

By detecting defects before they waste materials, manpower or production time...by making invisible defects visible before machinery breaks down in service, Magnaflux Commercial Inspection is saving money for hundreds of companies. It is also preventing needless rejection of materials or parts for seeming defects that are actually harmless to service life.

If you have an inspection problem



-or must meet contract requirements for inspection-these booklets may help you with the practical solution. Mail coupon for either or both.

## AFLUX





ction Available Through 11 Principal Cities: New York 23 • E. Hartford, Cann. • Chicago 47 • Cleveland 15 Detroit 11 • Witchito, Kan. • Dallas 9 • Houston, Texas Los Angeles 58 • Galtland 6 • Odessa, Texas

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	Please send me a copy of your bulletin on:
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	Company
	Address
	City Zone State



# "... On the feet of Individuals."

Society advances on the feet of individuals. We Americans live under the highest standard ever achieved because we believe in and are permitted currently to practice three of the cardinal principles of progress—Invention, Research and COMPETITION.

Nineteen basic inventions influence our pattern of life today. Each one was created to satisfy a fundamental need for improvement—a modern means of competing as against outmoded procedure. Each one, such as the electric light, the telegraph, the amplifying tube, the induction motor, created a new industry in which numerous companies strove in free competition for the maximum share of business.

For example, since Thomas Edison invented the incandescent filament lamp in 1880, the electric light industry has grown to an annual volume of \$501,500,000 in light bulbs alone; in May, 1906 the Wright Brothers received the patent for their flying machine; the value of aviation manufactures in 1951 in the United States alone was estimated at \$3,350,000,000 and in February, 1952, records show a \$10½ billion backlog of orders.

More rapid still is the growth of the radiotelevision industry which today produces some \$230 million worth of home radio sets and \$1,570,800,000 in television sets. In every case, employment and sales volume grew enormously and the public enjoyed huge personal benefits.

Side by side with Invention came Research, exemplified by the competition of intelligent men questing for new materials, new methods, new processes, new scientific truths. Current advertisements tell of hundred-year tests to assure better materials for the future, technology that produces metals to withstand almost inconceivable heat, machines calculating 20,000 times faster than the mind of man, medicines that cure "incurable" diseases, food processes that cook, sterilize and pack hundreds of cans a minute. And in every case, the public enjoys huge personal benefits.

This is what James A. Decker undoubtedly had in mind when he wrote the line, "Society advances on the feet of individuals." These "individuals" are you and I, all our countrymen, benefiting every day from Invention, Research—and from COMPETITION.

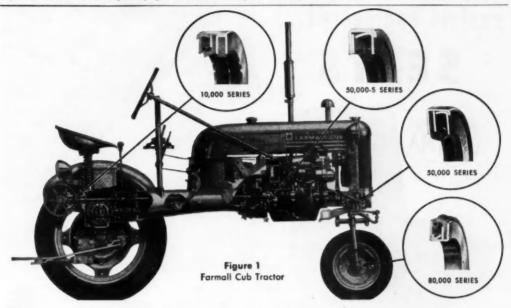
Developing inventions, marketing products, and pursuing scientific research require substantial investments. A grave danger to their future now looms. In 1951, corporation net profits suffered a loss of 21% over the previous year. The reason—taxes too high, government controls and policies that interfere too greatly with private industry. If this continues, financial resources will dwindle, competition will be stifled.

Without free competition, American progress stops. No country can long exist when its government calls all the shots. We need competition to assure progress for people.

\* \* \*

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The design of agricultural equipment must provide for utmost dependability despite hard knocks in service and unpredictable maintenance by the user. In the compact Farmall Cub tractor, International Harvester uses oil seals at many vital points to assure a maximum of mechanical reliability.

Several different sealing problems are present in the Cub (Figure 1). On the front wheel shaft, heavy accumulations of dirt and dust must be excluded while grease is retained around the bearing. A spring-loaded external seal with a sturdy leather sealing member (National 80,000 series) is used. On the steering shaft, dirt accumulation is less severe, but there is oscillating shaft movement. A conventional spring-loaded leather seal (National 50,000

series) meets this problem and retains gear grease.

At the rear crankshaft bearing, operating temperatures are higher; so National Syntech\* (50,000-S series) are used. These seals are ideal for this application since their synthetic rubber sealing members are capable of withstanding intermittent temperatures up to 300° F.

On the power take-off assembly, dust exclusion is a big problem along with lubricant retention; so a dual seal with one leather and one felt sealing lip is used (National 10,000 series). On the rear wheels and the transmission spline shaft, seals are encased in a housing and the principal problem is lubricant retention. Here effective sealing is obtained with spring-loaded leather seals

in a special case to simplify mounting. Each sealing problem in the Farmall Cub is met with a different type of seal. However, the majority of seals used are of standard design and are thus readily available with a minimum of tooling cost. Many sealing problems can be solved economically with standard design seals; other applications require special seals to meet special problems. In either case, National Oil Seal engineers can apply 30 years of experience to the problem.

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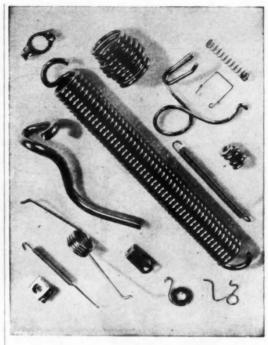
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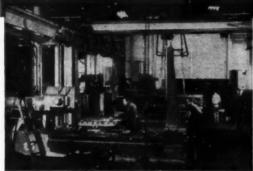


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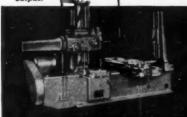
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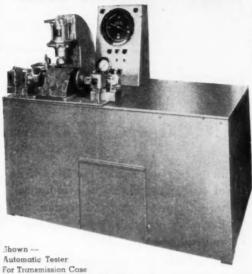
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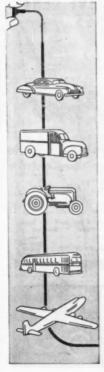
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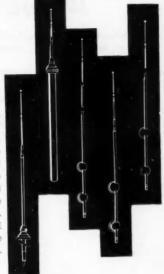
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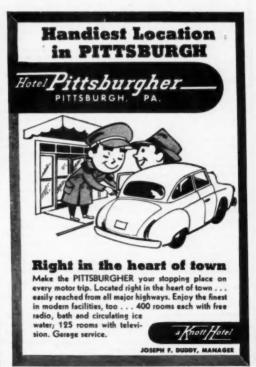
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For thirteen consecutive races—every race run from 1936 to 1952—EVERLOCK WASHERS have ridden with the first, second and third place winners. The world's top race car builders specify EVERLOCK because they know its wide chisel edges, gripping under powerful spring tension, will give complete protection against the loosening action of terrific vibration and strain during the grueling 500-mile run. Examination of winning cars has invariably shown EVERLOCK WASHERS as tight at the finish as at the start.

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EVERLOCK Washers are made in external type, internal type, internal-external combination type, countersunk type, and many special types in a great variety of sizes. Test them on your own assemblies. See how they reduce production costs, service costs and build good will.

THERE'S AN EVERLOCK LOCKWASHER FOR EVERY NEED

THOMPSON-BREMER & CO. ● Subsidiary of American Machine and Foundry Co., New York 1642 W. Hubbard St., Chicago 22, III.



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PRECISION PLUS is assured in Timken bearings by careful and accurate testing procedures like the one above. In a sound proof room, bearings are placed on an instrument that "hears" imperfections. If foreign noise is heard, the bearing is discarded.



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